Electric Starting and Lighting

The AUTOMOBILE

Vol. XXXV
No. 22

NEW YORK, NOVEMBER 30, 1916

Ten cents a copy
Three dollars a year

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Stewart Products

Stewart Speedometer
$25

Stewart V-Ray Spark-Plug
$1

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It exists in memory only. It's a thing of the past. The dull-winter-business period of previous years is dead. Let's bury it—then forget it.

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More cars will be in use *this winter* than were driven in the summer two years ago. At least 75 per cent of the cars will be in constant service.

This means that there is a *big winter* business for you if you will only go after it.

And don't forget, Stewart Products will sell faster than ever. Each Stewart Product is a real necessity for the car in winter as well as summer.

"It will pay you to see that every car is Stewart equipped."

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CHICAGO, U. S. A.

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Stewart Tire Pump
$12

Stewart Hand Operated Warning Signal
$3.50

Stewart Speedometer for Fords
$10

The AUTOMOBILE

VOL. XXXV NEW YORK—THURSDAY, NOVEMBER 30, 1916—CHICAGO NO. 22

Hydraulic Steel Co. Refinancing

Plans $10,000,000 Co.—Standard Oil Interests Back of Reorganization

CLEVELAND, OHIO, Nov. 27—The Hydraulic Pressed Steel Co., one of the largest producers of pressed steel wheels, frames and forgings, has a plan under consideration with the Standard Oil Co., which provides for the formation of a $10,000,000 company which will include the Hydraulic company and one other. Under this plan the holders of the Hydraulic common will receive approximately $108 cash for each share plus $162 par in the stock of the new company. By the deal this would mean a withdrawal of part of their investment in cash by sellers of the Hydraulic stock while the balance would remain in the company as now.

The management would undergo virtually no change and the board of directors would include Clevelanders and representatives of the country's leading financial interests. The Hydraulic company would continue to manufacture its present lines, according to the plan, and would enlarge its output.

This company was organized in 1906 and its production has amounted to $7,000,000 yearly.

—

Farr Leaves SKF Bearing Co.

HARTFORD, CONN., Nov. 28—A. V. Farr has become sales manager of the Hess Steel Corp., Baltimore, Md. He was formerly advertising manager of the SKF Ball Bearing Co., this city.

—

Herschell-Spillman Adds New Model

NORTH TONAWANDA, N. Y., Nov. 28—The Herschell-Spillman Co., whose motors now are used in a large number of passenger cars and commercial vehicles, is shortly to bring out a new model. It will be a 3¼ by 5 motor, of L-head design, for commercial vehicle and small car use. The present capacity of the plant is from 15,000 to 20,000 of these motors a year. Details of the new motor are at present being worked out by Designer E. O. Spillman, and it is hoped to have samples ready by Jan. 1.

—

Schoeneck to Make One Chassis

CHICAGO, Nov. 27—The Schoeneck Co., of which J. Alvin is president, will produce one chassis equipped with four body models. These are two, four, six and seven-passenger types. The car is equipped with a 4 by 5½ in. six-cylinder Herschell-Spillman motor, other equipment including a Brown-Lipe four-speed gearset, Brown-Lipe disk clutch and Timken axle. The wheelbase is 139 in. and tires are 34 by 4½.

—

Schaaf with Fisher Tractor Interests

INDIANAPOLIS, Nov. 27—A. R. Schaaf, for many years secretary of the Fiat Automobile Co., Poughkeepsie, N. Y., and previous to that connected with the Pope Mfg. Co., Toledo, Ohio, has united with Carl G. Fisher in the manufacture of a farm tractor and will associate himself with that organization in the capacity of factory manager.

—

Pfeffer to Retire from Chalmers

DETROIT, Nov. 28—C. A. Pfeffer, vice-president and assistant general manager of the Chalmers Motor Co., this city, will retire shortly from that company to enter into business for himself. He will remain, however, as a stockholder and director.

—

Hibbard Is Regal Asst. Sales Mgr.

DETROIT, Nov. 27—V. S. Hibbard has joined the Regal Motor Car Co. as assistant sales manager. Mr. Hibbard was formerly sales and advertising manager of the R. C. H. Corp.

Oct. Truck Exports Smaller

Drop Nearly $2,000,000 in Value—Passenger Cars Gain —Total $9,341,119

			1916		
Mos.	Cars	Value	Trucks	Value	Parts
Oct.	4880	$3,756,768	1144	$3,635,291	$1,949,060
Sept.	3585	2,819,405	1835	5,203,215	2,095,188
			1915		
Oct.	3479	2,749,255	1596	4,307,190	1,819,950

WASHINGTON, D. C., Nov. 27—The feature of the export trade in October was increased exports of passenger cars and parts with a diminution of exports in commercial cars. Figures just announced by the Department of Commerce show that during October last there were 1144 commercial cars, valued at $3,635,291, and 4880 passenger cars, valued at $3,756,768, together with parts to the value of $1,949,060, exported to various foreign countries. For the corresponding month of last year the figures were: Commercial cars, 1596, valued at $4,307,190; passenger cars, 3479, valued at $2,749,255; parts, not including engines and tires, $1,819,950.

During the 10 months of 1916 the figures show that 15,917 commercial cars, valued at $44,006,346, and 51,699 passenger cars, valued at $36,049,497, together with parts, not including engines and tires, to the value of $20,091,793, were shipped abroad. During the same period of last year the commercial car exports numbered 18,865 machines, valued at $52,076,406 and passenger cars to the number of 34,515, valued at $29,543,227. The exports of parts, not including engines and tires, were valued at $12,814,809.

The big buyers in October last were as follows: France, 522 cars, valued at $1,782,088; United Kingdom, 684 cars, valued at $1,687,152; Canada, 1021 cars, valued at $718,962; West Indies and Bermuda, 665 cars, valued at $505,198.

Knickerbocker Co. Reorganized

Larger Output — Capital Is $500,000—To Add Tractors to Truck Line

NEW YORK, Nov. 24—The Knickerbocker Motors, Inc. has been incorporated in this city to take over the Knickerbocker Motor Truck Mfg. Co., which for several years has made trucks in New York City. The new corporation is essentially a reorganization of the old concern on a broader scale and contemplates the production of 500 chassis the first fiscal year.

H. G. Streat, president of the Streat Coal Co. and founder of the Knickerbocker Motor Truck Mfg. Co. is president; A. C. Brady, formerly president of the Brady-Murray Motors Corp., Chandler dealer in New York City is vice-president and sales manager; H. G. Streat, Jr., son of the president, is treasurer; and W. C. Guilder, formerly production manager for the Kelly-Springfield Motor Truck Co., designer of the first Garford trucks and early Macks, and also production man with the Timken-Detroit Axle Co., is production manager.

Mr. Streat, Clarence A. Ludlum, Charles H. Class, W. H. Bonynge and Grove D. Curtis are the directors.

The products will be a 2½-ton truck, a 5½-tonner and a 3-ton tractor. Two hundred of the 2½-tonners, 100 of the 5½-tonners and 200 tractors are expected to make up the first year's production.

The concern has an authorized capital of $500,000, all common, $10 par value per share. In a statement by W. A. Lewis and J. B. Linn, underwriting managers it is stated that $250,000 of this stock will be placed on the market, to be held until it is all paid for, subscribers receiving receipts to be held until it is all subscribed. If, after a reasonable time the stock is not all subscribed, the full amount paid in by subscribers will be returned. It is also stated that none of the capital thus raised will be used for promotion; but will all be devoted to the conduct and expansion of the business.

The concern will occupy the old plant of the Knickerbocker company at 151st Street and River Avenue, Bronx, New York.

—

Race Gillette Tire Sales Manager

EAU CLAIRE, WIS., Nov. 25—C. G. Race, until now general manager of the Chicago branch of the Gillette Safety Tire Co., this city, has assumed the position of general sales manager and a director of the Eau Claire concern. Further, the entrance of eastern capital into the company has caused it to increase its authorized capital from $250,000 to $1,000,000. As soon as possible, the second unit of the new tire and commercial rubber goods plant just completed will be undertaken, and by March 1 or April 1 the capacity will be more than doubled. Within a year it is hoped to increase the output to 1000 tires a day. R. B. Gillette, founder of the concern, continues as general manager.

—

Wilson Adds 1-Ton Model

DETROIT, Nov. 27—Smaller than the 2-ton single chassis upon which the J. C. Wilson Co. of this city has heretofore specialized, but incorporating the same general features of design, a 1-ton model of Wilson truck has just been placed on the market. The new model rounds out the line more than is at first apparent, since with tractors made by shortening the wheelbases of these two models it is possible to embrace practically all load capacities from 1 to 6 tons.

—

Smith Truck-Forming Attachment for All Cars

CHICAGO, Nov. 27—Additional capital brought about through the re-organization of the Smith-Form-A-Truck Co., and the taking over of this concern by the newly formed Smith Motor Truck Corp., is to make possible the extension of this particular truck-forming attachment to cars other than Fords. Already attachments are being made for such cars as Dodge, Maxwell, Buick, Overland and Chevrolet. The new unit for application to other cars will be known as the Universal, although this term does not have its usual meaning since units under this name will not apply to all cars for some time.

Attachments for Maxwell and Chevrolet have a frame of 4-in. channel section, the same as the unit for Fords and they sell at the same price as the Ford attachment or $350. This unit will convert this car into a 1-ton truck, but the larger size, the frame of which will be 5-in. channel section, will be designed for loads of 1500 lb.

Capacity for production of the attachment that has been made for Ford cars for the last 2 years is now 300 a day, and as announced last week, additions to the plant will be built which will practically double the floorspace and thus the company expects to be able within 3 months to take care of any demand that may come for these units either for Fords or other cars. At present the company is making an average of one a day of the Universal attachment, but is unable to keep pace with the demand for this particular unit, dealers in some cities asking for them in carload lots.

The method of attachment for the newer units is the same as for the Ford; that is, the rear axle of the car is used as a jackshaft for chain drive.

Detroit to Be Aviation Center?

Signal Corps, Representing Army and Navy, Visits Detroit and Buffalo

NEW YORK CITY, Nov. 27—The interest of the government in having automobile manufacturers take up the problem of aeroplane manufacture was evidenced last week when the Signal Corps, representing the Army and Navy, visited Detroit, Buffalo, and some other points with the thought of establishing aviation training stations in at least Detroit and Buffalo. The government recognizes that the automobile manufacturers are well qualified to carry out all work of aviation design and manufacture. There is no better manufacturing organization to handle such work and it is for this reason that these two cities are being considered, Detroit because of its leadership as an automobile manufacturing center and Buffalo because of the volume of aeroplane manufacture at present carried on there.

May Buy Joy Field

With this object in view the government is considering the possibility of taking over in Detroit what is known as the Joy Aviation Field, which is the testing ground purchased some time ago by the Packard company. The matter is only under contemplation. Howard Coffin of the Council of National Safety, and also of the Navy Consulting Board, has been making the rounds with the Signal Corps in its investigating work.

—

Stout Is Packard Aircraft Manager

DETROIT, Nov. 24—W. B. Stout has been appointed manager of the aircraft division of the Packard Motor Car Co. Mr. Stout is at present general sales manager and advertising manager of the Scripps-Booth Corp. He will resign his present position on Dec. 2.

—

Brown Becomes Scripps Sales Manager

DETROIT, Nov. 24—W. I. Brown, who has been assistant sales manager of the Scripps-Booth Corp., will become the general sales manager Dec. 1. Mr. Brown joined the Scripps-Booth company after resigning from Dodge Bros.

—

Smith Blair Truck Sales Manager

NEWARK, OHIO, Nov. 24—G. E. Smith has become sales manager of the Blair Motor Truck Co., F. L. Swanberg has resigned as manager. The management of the factory will be in charge of J. P. McCune and F. O. Spaulding.

Two 1917 Studebaker Chassis

Four-Cylinder in Three Body Styles—Six-Cylinder Available in Six

DETROIT, Nov. 28—*Special Telegram*—The program of the Studebaker Corp. for 1917 will include a four-cylinder and six-cylinder chassis. These are known as series 18. Both of these chassis and the bodies are considerably refined and improved in the direction of greater comfort and convenience for the passengers. Fundamentally neither chassis has been altered. Among the important changes are a reversible seat, so that the passenger can face either front or back. Both front seats are adjustable for different leg lengths and on the backs of the front seats there are flexible leather robe straps. The tonneau is roomier because of a new design of auxiliary seats which fold under the rear seat, instead of against the back of the front seat. These new seats are armchairs.

Pistons Are Lighter

In the engine the pistons have been lightened, to some extent reducing vibration, and the oil pump has been re-designed to move a more positive oil feed.

Although the rear axle is quite similar to last year's Timken bearing design, it has been materially strengthened and in the electrical system the characteristics have been altered to give about 12 per cent greater starting torque. There is a new convertible top known as Every-Weather which fits to the touring body, providing a sedan when in place. Better equipment is provided, particularly in the way of Blackmore door curtain openers which permit the side curtains to open with the door; also Yale lock for the ignition switch.

In the four-cylinder model there will be a three-passenger roadster at $930, a seven-passenger touring car at $940 and a three-passenger landau roadster at $1,150.

On the six chassis there will be a three-passenger roadster at $1,170, a seven-passenger touring car at $1,180; a three-passenger landau roadster at $1,350, a seven-passenger touring sedan at $1,700, a four-passenger coupé at $1,750 and a seven-passenger limousine at $2,600.

—

Charter Oak Six on Market Next Spring

HARTFORD, CONN., Nov. 27—Early spring is the time at which the recently incorporated Eastern Motors, Inc., this city, expects to have the first Charter Oak car on the market.

The Charter Oak is to be an assembled proposition combining a Herschell-Spillman six-cylinder engine, a four-speed Brown-Lipe transmission and Timken axles. It is the desire of the Eastern Motors, Inc., to build the car in Hartford. A canvass of possible sites for a factory have availed little as yet.

Rumor has it that the concern may possibly locate in Waterbury. The sales department announces that dealers have been secured for the first year's output at least. The temporary executive offices and the engineering department are located at 1026 Main Street in the Pilgard building. The major portion of the stock is owned in Waterbury.

—

Grant Will Move Shortly

DETROIT, Nov. 24—The Grant Motor Corp. of Findlay, Ohio, will move to its new plant in Cleveland within the next two weeks. The company still has 300 cars to finish at Findlay and will start production before Dec. 1 in Cleveland with a schedule for 1,000 cars in December.

—

General Motors Opens Marquette Plant

DETROIT, Nov. 24—The old Marquette motor plant at Saginaw, Mich., has been opened by the General Motors Corp. to be used as a storage and transfer house this winter. The plant has been opened to facilitate shipment of Buick cars.

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E. S. Swift an Overland Director

TOLEDO, OHIO, Nov. 24—E. S. Swift, vice-president of Swift & Co., Chicago, has been elected a director of the Willys-Overland Co.

—

Autocar Co. Elects Officers

ARDMORE, PA., Nov. 28—E. A. Fitts, formerly secretary and treasurer of the Autocar Co., this city, has been elected vice-president, and F. C. Lewin, formerly assistant secretary and treasurer, has been elected secretary and treasurer. J. C. Taney will take up Mr. Lewin's former duties. The other officers were re-elected, being D. S. Ludlum, president, and L. S. Clarke and W. W. Norton, vice-presidents.

—

Hoover ¾-Ton Delivery Car

YORK, PA., Nov. 27—A ¾-ton delivery car has been brought out by the Hoover Wagon Co., this city.

The engine is 3¾ by 4½ block cast design, cooled by thermo-syphon circulator through a cellular radiator. Ignition is supplied by a high-tension magneto with hand adjustable spark advance. The clutch is a three-plate design and the gearset has three speeds. Final drive is by shaft and two universals to a worm-driven semi-floating axle. Torque and propulsion being taken by the spring. Both springs are located on the rear wheel drum.

Four Companies To Raise Prices

Velie and McFarlan Cars and Riker and Chase Trucks Increased on Higher Cost

MOLINE, ILL., Nov. 27—The Velie Motors Corp., this city, will advance its prices $50 on the open bodies delivered on and after Jan. 1, 1917. Cars ordered and delivered prior to that date will be at the present prices, which are as follows: Model 28, $1,085 (with detachable sedan top, $1,285); four-passenger roadster, $1,085; two-passenger roadster $1,065; model 27, $1,550. The closed models are excepted from the advance.

—

McFarlan Raises Prices $300

CONNERSVILLE, IND., Nov. 24—The McFarlan Motor Co., this city, will raise its prices $300 after Dec. 1. Touring cars and companion models will list at $3,500 and closed work will list from $4,600 to $5,300.

—

Riker Prices to Be Higher

BRIDGEPORT, CONN., Nov. 24—The Locomobile Co. of America on Dec. 1 will raise the prices of the Riker trucks. The 3-ton truck will sell for $3,600, an increase of $100, and the 4-ton truck will sell for $3,750, also an increase of $100.

—

Winton Continues Two Sixes

CLEVELAND, OHIO, Nov. 24—The Winton Co., this city, will continue its present models in 1917 without change, Model 33 selling at $2,485 and the 48 at $3,500. The company, however, may make an increase in its prices.

—

Chase Raises Some Prices

SYRACUSE, N. Y., Nov. 27—On two of the Chase models an increase of $75 in list price has been made. These are the 1-tonner, raised from $1,650 to $1,725, and the 1½-tonner, from $1,950 to $2,025. Other prices remain the same as before.

—

Start Work on Kelly-Springfield Plant

NEW YORK CITY, Nov. 24—Engineers will start work in the near future on plans for the new plant of the Kelly-Springfield Tire Co. at Cumberland, Md. The plant will cover about 75 acres. Ground will be broken early next spring. The completion of the new plant will mean a minimum increase of 400 per cent of the present capacity of that company.

$50,000,000 Business for Pontiac

Financial Outlook There Bright for 1917—Nine New Car and Parts Cos.

DETROIT, MICH., Nov. 25—A banquet held at Pontiac last Thursday night, promised the city the brightest and most prosperous financial future in its history. There were nine new companies engaged in the manufacture of automobiles and automobile parts represented who promised approximately $50,000,000 worth of business to the city for the coming year.

The Olympian Mfg. Co. employing 300 men with a weekly pay roll of $6,000 estimated $2,000,000 worth of business for 1917. The Oakland-Northway Co., employing between 1000 and 1500 men with a monthly payroll of $65,000 to $100,000, estimates business for the coming year at from $40,000,000 to $50,000,000. The Monroe Motor Co., employing 500 men with a payroll of $9,000 weekly estimates its next year's business at $4,000,000. The American Forging & Socket Co., employing sixty to eighty men, weekly payroll $1,200 to $1,600, estimates $430,000 in 1917. The Michigan Drop Forge Co., employing ninety-seven men, has a weekly payroll of $2,225 and estimates its business for next year at $388,000. The Columbia Truck & Trailer Co., employing fifty men with a weekly payroll of $1,500, makes an estimate of $4,000,000 in 1917. The Markley Handle Co., employing twenty-one men with a weekly payroll of $400, estimates its business for next year at $50,000. The Vanauken Blower Co. will employ from twenty to twenty-five men with a $500 weekly payroll and makes an estimate of $97,500.

Among those who responded to toasts were: R. F. Monroe, president of the Monroe Motor Co.; F. G. Clark of the Columbia Truck & Trailer Co.; R. A. Palmer, president of the Olympian Motors Co., and T. H. McDearmon of the Oakland-Northway Co.

—

Page Buggy Adds to Force

DETROIT, Nov. 24—The Page Bros. Buggy Co., Marshall, Mich., manufacturers of automobile tops, has recently doubled the working force of the organization and is in search of more men. The company is supplying the Briscoe Motor Co. and others with automobile tops.

—

Cole Heads Perfection Tire Co.

CHICAGO, ILL., Nov. 24—C. R. Cole has become president of the new Perfection Tire & Rubber Co. as a result of the recent merger of that company with the Champion Auto Equipment Co., Wabash, Ind., and the Perfection Tire & Motor Co., Niagara Falls, Ont. Arrangements have been made for the transfer of the assets and obligations of each company to the new company, which has taken out a charter under the laws of Delaware. The other officers of the new company are: Vice-president, R. J. Evans; secretary, C. W. Harris and treasurer, E. A. Stickelman. In addition to the officers, the directorate consists of the following: F. E. Humphrey, T. J. Moll, T. W. Cole, and H. M. Scambler.

Outside of the patents, the new company will have tangible assets of nearly $1,000,000 with less than $25,000 of liabilities.

—

Haynes Plans Increased Production

DETROIT, Nov. 24—The Haynes Automobile Co. has made plans for the purchase of machinery for a capacity of 100 cars daily. A new building will be erected with a capacity for three times as many cars as are made at present, and will have 600,000 sq. ft. of floor space. The company has 350,000 sq. ft. at present.

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New Record for Delco Shipments

DAYTON, OHIO, Nov. 24—All former production records were broken last week in the plant of the Dayton Engineering Laboratories Co., this city. Though no figures were given as to the number of Delco systems shipped during the week, the former record was that ending Oct. 28, when 6836 systems were shipped.

—

Canadian Chevrolet Co. Expands

DETROIT, Nov. 24—Extensions are being made to the present plant of the Chevrolet Motor Co. of Canada, at Oshawa, Ont. The company has been manufacturing cars for a year and disposed of 8000 last year. Three new buildings are in process of erection and will give an added floor space of 277,075 sq. ft.

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Hilts Enters Advertising Agency

DETROIT, Nov. 28—M. R. Hilts has resigned as advertising manager of the Puritan Machine Co., this city, to enter an advertising agency in Chicago.

—

Vincent Wheel in New Location

DETROIT, MICH., Nov. 24—The Vincent Clear-Room Steering Wheel Co., this city, has moved to 756 Woodward Avenue, the former offices of the Hyatt Roller Bearing Co. This company recently effected a reorganization by which E. H. Vincent became president and general manager; J. A. Martin, vice-president; H. H. Vincent, secretary and treasurer, and G. F. Burger, sales manager.

Detroit Electrics in Quantity

New Model $500 Lower Because of Standardized Design and Greater Production

DETROIT, Nov. 27—An entirely new Detroit electric has been brought out by the Anderson Electric Car Co., this city. The new model, known as 68, represents the initiation of a production policy for Detroit electrics. As a result of a greater increased production schedule the model 68 will sell for $500 less than its predecessor. This cut from $2,275 to $1,775 in the face of greater increased cost of materials represents the saving due to the installation of a large amount of labor-saving machinery and the adoption of a standardized chassis in which the number of options has been minimized so far as color and equipment is concerned. For instance, in upholstery there are three designs to choose from, while in painting there is one standard, whereas last year there was an unlimited field for either upholstery or painting. No sacrifice in material or workmanship has been made in any part in quoting the new figure.

The body is a brougham having a passenger capacity of four and is built on a chassis of 100 in. wheelbase with 56 in. tread. It has the standard Anderson motor with forty-two cells, thirteen-plate battery, giving a speed of 6 to 25 m.p.h. and a mileage of 75 to 100 on a battery charge.

100 Per Cent Business Gain

Officials of the Anderson company estimate at the present rate of increase the company's current year's business in electric passenger cars will exceed last year's by at least 100 per cent. The raw material for building the coming year's product has either been delivered to the plant or is under contract for specified delivery dates. The production of Detroit electric cars increased in 1916 over 1915 by 141 per cent, while the labor increase was not 100 per cent. This ratio is due to the introduction of a large amount of new machinery.

The first 4 months of this fiscal year show an increase of 79 per cent over last year.

The company has just erected in Detroit a new four-story service building of brick which has a capacity of 400 cars with repair and charging facilities and a large show and sales room.

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Dort Director of Guaranty Securities

DETROIT, Nov. 27—J. D. Dort, president of the Dort Motor Car Co., has been made a director of the Guaranty Securities Corp. of New York.

Parcel Post to S. A. Wrong

U. S. Accessory Makers Making Serious Error by Shipping Goods That Way

BUENOS AIRES, ARGENTINA, Oct. 31—U. S. A. accessory manufacturers are making a serious error by sending accessories by parcel post to automobile dealers in Argentina. While the parcel post service is entirely satisfactory for such trade in the U. S. A. it does not work out satisfactorily here; in fact it is the most unsatisfactory way of sending small accessory parts to this country.

Recently a large dealer in Rosario had a typical experience with parcel post. An anti-glare equipment for headlights was sent from a U. S. A. maker and here is the chain of troubles the Rosario dealer had to solve:

"A few days after the anti-glare devices arrived I received an official card without stamp. I presented this at the post office which is only open from 10 to 12, that is that particular section of it. I was asked to call the next day and fortunately found the right man in. I presented the official card and was politely asked to go four doors away to get twelve centavo stamps on it (a centavo is approximately ½ cent, U. S. A. currency). On my return with this they looked a long time to find cards that had come with the parcels. I was sent with these cards to another place where I had to purchase sixty-nine centavo stamps, costing 35 cents. On my return with these and after waiting half an hour I tried to get the package but instead was sent to the custom house.

Ransoming the Package

"At the custom house the real stamping act work begun and for each parcel I had to put a pesos (44 cents) stamp. I required two of these, or 88 cents. With these duties the cost of the anti-glare device was just five times what it sells for in the U. S. A. In addition I had spent nearly a week getting the parcel post package through the post office and custom house.

"After all this trouble I asked what I had been paying for and the chief of the department advised me that the parcel post of the United States is a one-sided affair, and while they send any parcel away from the U. S. A. at regular rates yet in Argentina they charge duties and customs as they wish. The United States should get real parcel post service as far as Argentina is concerned. For reasons I cannot explain parcel post packages from Europe enter Argentina free. When asking why this is, the only answer you get is that if anything is wrong the U. S. A. is at fault. It is pretty hard to buy U. S. A. accessories here and pay exorbitant duties while European goods come in free. It is a subject which U. S. A. accessory manufacturers should consider.

"Now that U. S. A. cars are selling in good quantities through Argentina it is imperative to have accessories for them. Naturally parcel post is one of the simple ways of handling this work and it should be worth while to get parcel post service for Argentina on the same basis as that from England."

Troubles With Shipments

This is only one of the many difficulties the South American automobile dealer has to put up with in connection with shipments from the U. S. A. Recently a large accessory dealer from Cordoba, a city in the interior of Argentina, was required to make a night's trip by railroad from Cordoba to Buenos Aires because of custom difficulties in connection with U. S. A. shipments. The dealer makes a specialty of U. S. A accessories, but has constant troubles with shipments. On the occasion in question the New York shipper had not made his shipping documents correspond with packages sent. The shipping document showed five packages or crates but there were only four in the custom house. An examination disclosed the fact that the shipping department had combined two of the crates without making the necessary corrections on the document. This resulted in a cost of nearly $70 U. S. A. gold to the Cordoba dealer.

Recently a Buenos Aires dealer in hardware and automobile accessories cited another glaring example of the treatment Argentine merchants are being given at the hands of U. S. A. makers. The dealer here ordered $400 (U. S. A. gold) worth of certain hardware. It was necessary to pay cash with order in order to be assured of reasonably prompt delivery. This order was placed in August, 1915, practically a year ago. In September, 1916, the shipment had not arrived. It arrived a few weeks ago. The U. S. A. manufacturer had the use of the money for a whole year. During that time numerous excuses for delayed delivery had been made. When the order was placed in 1915 there was a great shortage of this kind of hardware in Buenos Aires and the dealer would have had a good ready market. Now conditions have changed. Other supplies have arrived and the market is lower. It is almost impossible in the face of such treatment to see any possibility of U. S. A. firms holding Argentine trade after the present war unless it is that European countries are not financially able to come back and give the market service which they gave before the opening of the war in July, 1914.

Shippers Must Remove Freight

Given 10 Days or Goods Will Be Removed and Stored at Their Risk

NEW YORK, Nov. 28—The freight car shortages has become so serious as a result of the big tieup of cars being used on tracks other than their own, that immediate steps have been taken by the railroads to relieve this condition. All of the railroads of the country have been notified to return to their home lines as soon as possible all cars not their own, especially those used for perishable freight. All shippers and receivers have been notified that freight left on cars for 10 days will be summarily removed by the railroads and the shipment stored at the shipper's or consignee's risk.

Freightage has become so heavy on the smaller railroad lines, that they have been forced to borrow cars from the larger lines, thus curtailing their use on larger lines where they are badly needed at the present time. For instance, one line running out of Detroit bought 9000 cars last year. Less than one-third of these are now in use on its tracks.

With the exception of Fords, which are shipped in parts to assembly plants, all automobiles are being shipped in special cars, either with end doors or very wide side doors. When these cars are diverted to other traffic, the rest of the box cars become useless. Some of the automobile factories have been taking long chances by shipping their products in flat cars over which they constructed temporary tops and in coal cars covered with tarpaulins.

Car Makers Unable to Ship

DETROIT, Nov. 25—More than $4,000,000 worth of automobiles are awaiting freight cars to carry them to their destinations. The shortage has become so severe that manufacturers are seeking storage space so that they can manufacture far enough ahead to care for future business.

Goodrich Accessory Assn. Changes Name

PHILADELPHIA, Nov. 27—The Goodrich Accessory Association of Philadelphia, manufacturer of the Goodrich lock and switch for Fords, license brackets, truss rods, ignition assemblies, and brake shoes for Fords, has changed its name to the Goodrich-Lenhart Mfg. Co., with offices in the Widener Building as heretofore.

The officers of the company remain the same, Ivan Goodrich is acting president and manager of sales, and Mr. Lenhart will continue in active charge of the factory in Hamburg, Pa.

S. A. E. Testing System Proved

Specifications for Acceleration and Economy Tried Out Successfully

NEW YORK, Nov. 21—Yesterday and to-day the research division of the S. A. E. standards committee tried out their recommended standard form for economy and acceleration testing, using the Sheepshead Bay speedway for the trial. It was desired to ascertain if the committee's recommendations were entirely practical, which proved to be the case. Cars for the test were lent by the Marmon company and the Packard company and members of the New York staffs of these firms assisted the members of the committee.

For the acceleration tests records were made on rolls of paper, marks being made as the car reached successive distances equally spaced. In one system there were switches set on the track 100 ft. apart, these being set by a device attached to the front axle, and in this case the recording drum with the paper was stationary. In the other the track switches were replaced by a commutator attached to the front wheel of the car, which made contact once during each turn of the wheel, the recording drum being carried on the car.

In comparing the two methods it would appear that the stationary apparatus is more convenient for a series of tests on different cars, while that mounted in the car itself is a little more flexible for use on the one car. The record of the former is more compact and easier to use for plotting, because there are a smaller number of indications of distance, and these are in even figures. With the latter, acceleration runs are not limited in length, and can be made at any convenient place. There was some discussion as to the accuracy of measuring distance by the front wheel but it was found that two measurements, one at high speed and the other at low speed, checked accurately within the limits of personal error. The slight apparent difference was that the wheel made two more revolutions at high speed than at low speed over the same distance. There is still some question as to the accuracy of a chronometer carried on a car moving at high speed. A series of apparently perfect records was obtained by both methods, in a number of instances records being made by both devices on the same car during the same run.

Each of the cars was given a series of runs for fuel economy, one covering 4 miles at speeds of 6.9, 11.9, 21.5, 27.5, 40, 53.5, 63 m.p.h., and the other being given a similar series of runs at speeds of 9, 19.5, 29.5, 44, 57 and 63 m.p.h. As this was in no sense a regular test of the cars, they were run part of the time with tops down instead of up as called for in the tentative recommendation of the division. Also as the time devoted to the fuel-economy runs was limited, the lengths of different runs were cut down from the specific distance of 10 miles at each of the various speeds except the lowest, which is to be of sufficient length to consume at least 2 lb. of fuel, making complete circuits of the course.

The method used for measuring the fuel is to have two small tanks mounted on the windshield. One of the tanks is arranged for easy detachment so that it can be weighed before and after each run. Both are connected to the carbureter after the regular gasoline pipe is disconnected. The shut-off cocks from the two tanks are interconnected so that the same motion shuts one cock and opens the other.

The tank containing the unweighed fuel is used for manipulating the car and driving before each run at the same speed at which the run is to be made, in order to get the car to the temperature prevailing during the run. As the starting line is crossed the change is made from the unweighed tank to the weighed one, and vice versa at the finish line.

New Madison Four-Passenger Roadster

ANDERSON, IND., Nov. 27—The Madison Motors Corp. is placing on the market a new four-passenger roadster on its 120-in. chassis. It is equipped with a 3⅛ by 5 in. Rutenbur engine, and lists at $1,150. The finish is mouse-gray, with red wheels and black fenders.

Remodel Aeroplane Factory

DETROIT, Nov. 25—The Williams Aeroplane factory at Fenton, Mich., has been remodeled and made ready for new machinery.

Ontario Registrations

WALKERVILLE, ONT., Nov. 24—The province of Ontario leads the other Canadian provinces with 36,300 registrations. Saskatchewan is next with 11,966; British Columbia, third with 9100. There are about 120,000 cars in the whole of Canada, of which 100,363 are Fords.

Toronto leads with 8815 cars as compared with 7367 in 1915. Montreal is second with 3917; Vancouver, third with 3688; and Winnipeg fourth with 3688.

254,000 Ohio 1917 Registrations

COLUMBUS, OHIO, Nov. 25—So far 254,000 registrations for 1917 for automobiles have been issued in Ohio. That number includes gasoline and electric car owners as well as dealers and manufacturers.

S. A. E. Sections Are Active

Truck Division of Standards Committee Meets—Detroit Banquet Dec. 15

NEW YORK, Nov. 28—A meeting of the truck standards division of the Society of Automobile Engineers was held in Detroit yesterday, for the consideration of military truck specifications. General progress in the consideration of the subject was made. H. D. Church of the Packard company presided, and General Manager Coker Clarkson attended.

At the next meeting of the Indiana Section, S. A. E., Dec. 15, the subject for consideration will be carbureters and manifolds.

The Cleveland Section S. A. E. at its meeting Dec. 15 will have a paper by J. B. Replogle on how car manufacturers can co-operate with manufacturers of electrical apparatus, such as starting, lighting and ignition. Mr. Replogle is research engineer of the Remy Electric Co.

The Mid-West Section will hold its December meeting on Friday the eighth at Chicago, when Prof. Roach of Armour Institute will outline a new method of test for gasoline engines.

At the meeting of the Metropolitan Section S. A. E. New York, Dec. 21, Elmer Sperry, inventor of the gyroscope and authority on aviation engineering, will speak on the military aspect of aviation possibilities in America.

The Detroit Section, S. A. E., has decided that its annual banquet to the automobile industry will be held at 7 o'clock on Friday evening, Dec. 15, at the Ponchartrain Hotel. This will be the second dinner of the kind by this section, the one a year ago marking the start of the movement.

Belgian Automobile Engineers in Detroit

DETROIT, Nov. 28—P. E. Kellecom and J. R. Perrier, engineers of the Fabrique National des Armes de Guerre of Belgium, are in this city investigating the automobile production. They state that the European countries plan to enter immediate quantity production at the end of the war.

Cadillac Builds New Sales Structure

DETROIT, Nov. 27—The Cadillac Motor Car Co. will erect a seven-story structure on the site of several temporary buildings, and will use it exclusively for retail sales and service. The building will contain 154,000 sq. ft. of floor space and will have a special feature of a reception room for the service department that will measure 65 by 116 ft., with a domed ceiling 29 ft. high.

Want Higher Fees for Trucks

Commissions Appointed by N. Y. and N. J. Seek Basis Covering Wear on Roads

NEW YORK, Nov. 27—Commissions have been appointed in this State and in New Jersey to determine an equitable basis for increasing the motor truck registration fees. This action is due to the depreciation of the roads in these States, a large measure of which, it is claimed, is caused by the increasing use of motor trucks. The work of the New York commission applies only to the State roads, and, since only about one-fifth of the trucks in the State are driven over these roads, the problem of arriving at a just determination as to how trucks shall pay in proportion to their use of these highways is very difficult. The task of the New Jersey commission is no easier, due to the practical impossibility of increasing the fees of the vehicles responsible for the wear on the roads without discriminatory taxation.

Of National Importance

Any action taken in New York and New Jersey in increasing registration fees for motor trucks will have a wide influence on the procedure in other States throughout the country, so the matter is of national importance.

The New York State Commission, composed of the State engineer, the commissioner of public works and the highway engineer held its first public hearing at Albany Nov. 21. This commission has not yet promulgated any new proposed schedule, so that the first hearing before it resulted in the giving of suggestion. Among the most important of these was the fact that roads should be classed as governmental or State institutions, benefiting alike those who use them as well as those maintaining plants in the area served or those who own real estate in the same territory.

It was pointed out that any law passed basing fees upon the extent of use and wear and tear of roads should include all forms of vehicles, including horse wagons, as well as automobiles and motor trucks. If motor trucks are taxed and not the other types, such a provision would be unconstitutional because of its discriminatory nature.

The impossibility of living up to the word of the New York State law which specifically provides that the new schedule of fees be based upon the extent of use and amount of wear and tear, was brought out by the fact that any such determination along scientific lines would require a tremendous amount of experimentation of various kinds of vehicles operating over various classes of roads at various times of the year.

It was pointed out that upon principle all vehicles should be charged a certain fee to cover registration for identification only and that any additional tax to help pay for the cost of construction and maintenance of the roads should be placed upon all vehicles.

The New Jersey State Commission, which is formed of the engineers of the various counties, acting under the supervision of the State Commissioner of Motor Vehicles is seeking to preserve the present roads until such time as new roads can be built to carry the vastly increased amount of traffic now passing through the State. This Commission, like the one in New York, has its powers limited to the taxation of the motor truck alone and it cannot decide upon any similar tax for horse vehicles.

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Geronimo Plant for Enid, Okla.

ENID, OKLA., Nov. 25—The Geronimo Motor Car Co. has been organized to manufacture automobiles in this city in a three-story plant. It will produce a six-cylinder car with a Continental motor. The directorate consists of mostly local bankers, and the capital is $500,000. Shands & Funnel are the fiscal agents for the company.

W. C. Allen is president, G. E. Darland is secretary and treasurer and Walter Krouse is vice-president. F. B. Buzzard is a director.

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Overland Opens N. Y. Salesroom

NEW YORK, Nov. 28—The Willys-Overland Co. to-day opened its new retail sales and display rooms on Broadway and Fiftieth Street. This building is three stories and has a frontage on Broadway of 100 ft.

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Local Shows

NEW ORLEANS, Nov. 27—The success of the automobile displays at the National Farm and Live Stock Show here has caused much talk among dealers for a concerted effort toward making this exhibition the occasion of an automobile show. The eight dealers who have displays there are telling of sales made and of many prospects obtained. The reason for the limited number of displays was that the managers of the show proposed a tent exhibit, but later consented to place the automobiles in the Manufacturers' Hall. The dealers hope by beginning in time to arrange for suitable quarters next year.

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Worcester Show a Success

WORCESTER, MASS., Nov. 25—The second annual show of the Worcester Automobile Dealers Assn. ended here to-night and it proved to be a bigger success than the men anticipated.

U. S. Wheel Corp. Is Organized

New Concern Will Manufacture Baker Pressed Steel Wheel—Production Starts Jan. 1

CHICAGO, Nov. 28—The U. S. Wheel Corp. is a new organization formed for the purpose of manufacturing the Baker pressed steel wheel for automobiles, motor trucks, tractors, etc. This concern is an outcome of the Baker Wheel & Rim Co., of this city, a $5,000 corporation organized for the development of the Baker wheel. The U. S. Wheel Corp., which has absorbed the Baker Wheel & Rim Co., will have a large capitalization. Factory location has not yet been decided upon and at the start production will be by having the most of the work done by pressed steel specialists. Production will be started soon after Jan. 1.

Spokes Under Tension

The Baker pressed steel wheel is a flat-spoke type with spokes arranged bicycle-wheel fashion and held under tension. The wheel is stamped from an original circular piece of steel. It is first converted into a plate-shaped stamping resembling a large brake drum which would be the diameter of the wheel. By a further stamping process the spokes are formed. Alternate spokes attach to opposite ends of the hubs, giving two circles of spokes. The wheel is of approximately the same weight as an artillery wood wheel for motor cars. At present two of the large automobile makers are testing the wheel and others are arranging to test it.

The U. S. Wheel Corp. will have for its president, Chas. G. Hawley, a Chicago man representing financial interests. Jos. A. Anglada, consulting engineer of New York City, will be vice-president. For 3 years Mr. Anglada was chairman of the Metropolitan Section S. A. E. Erle K. Baker, inventor of the wheel, will be secretary. Mr. Baker is best known as the inventor of the Baker split rim, which is now used exclusively by the General Motors. Mr. Anglada will move to Chicago to devote his entire work to the organization.

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Reo Makes Additions to Factory

LANSING, MICH., Nov. 27—The Reo Motor Car Co. is adding two large buildings to its plant. The larger will be 76 by 528, and will be used as a machine shop, and the smaller will be 95 by 224 and will be occupied for heat-treating purposes. The company is also completing a garage and a clubhouse for its employees.

Studebaker Holds Conference

225 Officials Attend South Bend and Detroit Meeting —Interesting Addresses

SOUTH BEND, IND., Nov. 27—More than 225 officials, branch managers, blockmen and dealers connected with the Studebaker sales department, were entertained Wednesday at the annual conference. The program which started in South Bend was concluded Thursday and Friday at the Detroit factory, followed by private conferences with branch managers and blockmen on Saturday. The yearly conference is a sort of debutante party for the new model car, which is brought out about this time.

Four Addresses

Four addresses were delivered at the meeting Wednesday morning in the administration building. The welcome was delivered by F. S. Fish, chairman of the board, who was followed by President A. R. Erskine, giving a resume of the year's work. J. M. Studebaker followed Mr. Erskine, with a talk on "Sixty-four Years of Business Administration." L. J. Ollier spoke at length on the sales policy for 1917. He stated that the corporation did a larger business last year than ever before and that they expected to exceed all previous sales records in 1917.

Speeches at Detroit

Addresses at Detroit were made by R. T. Hodgkins, general sales manager, C. C. Hanch, treasurer, H. T. Myers, commercial car manager and G. L. Willman, assistant sales manager and advertising manager.

L. Markle, the Chicago Studebaker representative, to-day, told of the Studebaker systematic service plan of caring for the car after it is sold, C. N. Weaver, of San Francisco discussed "Exclusive Representation," and E. R. Benson, Portland, Me. presented the dealer's view of Studebaker methods.

The convention closed to-day, with a banquet at the Detroit Athletic Club. L. J. Ollier, vice-president, presided as toast-master.

Special Train for Overland Convention

ST. LOUIS, Nov. 27.—T. L. Hausmann of the Overland Automobile Co. of St. Louis has completed arrangements for a special train to leave here the night of Dec. 10 to take 150 persons to Toledo for the annual Overland convention. The train will be of fifteen sleepers and the delegation will include the local sales force and nearby dealers.

Electric Auto-Lite Service Meeting

TOLEDO, OHIO, Nov. 27—The Electric Auto-Lite Co., this city, will hold a meeting for its service representatives at the factory Dec. 4 and 5, at which it is expected that more than seventy-five will be in attendance.

Bennett Perfecting Distribution Plan

DETROIT, Nov. 24—O. G. Bennett, who resigned from the presidency of the General Export Co., is developing a new automobile distribution plan.

Moon Ships to Porto Rico

ST. LOUIS, MO., Nov. 27—The Moon Motor Car Co. has made a shipment of twenty-five cars to Santiago A. Panzardi of San Juan, Porto Rico, which has taken fifty-five cars from this company since May. The company has agencies in Cuba and formerly sold French and other European cars.

Decker Top Increases Capital

DETROIT, Nov. 24—The Decker Auto Top Co. has increased its capital from $15,000 to $50,000.

Gary Truck Capital Doubled

SOUTH BEND, IND., Nov. 27—The Gary Motor Truck Co., Gary, Ind., has increased its capital stock from $25,000 to $50,000.

Daily Market Reports for the Past Week

Material	Tues.	Wed.	Thur.	Fri.	Sat.	Week's Ch'ge
Aluminum, lb.	.65	.65	.65	.65	.65	...
Antimony, lb.	.14	.14	.14	.14	.14	...
Beams & Channels, 100 lb.	2.97	3.17	3.17	3.17	3.17	+ .20
Bessemer Steel, ton	52.50	52.50	52.50	52.50	52.50	...
Copper, Elec., lb.	.33	.35	.35	.35	.35	+ .02
Copper, Lake, lb.	.33	.35	.35	.35	.35	+ .02
Cottonseed Oil, bbl.	12.85	12.75	12.65	12.75	12.70	— .15
Fish Oil, Menhaden, Brown, gal.	.68	.68	.68	.68	.68	...
Gasoline, Auto, bbl.	.22	.22	.22	.22	.22	...
Lard Oil, prime, gal.	1.30	1.30	1.30	1.30	1.30	...
Lead, 100 lb.	7.15	7.20	7.30	7.30	7.30	+ .15
Linseed Oil, gal.	.96	.96	.96	.96	.96	...
Open-Hearth Steel, ton	52.50	52.50	52.50	52.50	52.50	...
Petroleum, bbl., Kans., crude	.90	.90	.90	.90	.90	...
Petroleum, bbl., Pa., crude	2.60	2.60	2.60	2.60	2.60	...
Rapeseed Oil, refined, gal.	.95	.95	.95	.95	.95	...
Rubber, Fine Up-River, Para, lb.	.80	.80	.80	.80	.80	...
Rubber, Ceylon, First Latex, lb.	.69	.71½	.70	.70	.70	+ .01
Sulphuric Acid, 60 Baume, gal.	1.50	1.50	1.50	1.50	1.50	...
Tin, 100 lb.	45.30	45.75	45.50	45.50	45.50	+ .20
Tire Scrap, lb.	.06¼	.06¼	.06¼	.06¼	.06¼	...

Materials Market Steady

Copper, Steel and Lead Slightly Higher—Rubber and Oils Little Changed

NEW YORK, Nov. 27—Prices on automobile materials last week were exceedingly steady, despite the scarcity of these products and the large demand for them. Copper, which has been uppermost in the skyward activities of the metals, has risen 2 cents more a pound to 35 cents. Beams and channels, after quite a steady period, have taken a turn upward, rising to $3.17 per 100 lb., a net gain of 20 cents for the week. Lead prices, always fluctuating, reached $7.30 per 100 lb. on Thursday, holding at that price through to Saturday.

Rubber and the oils have been unusually steady, with few price changes. Shipments of rubber have been coming in regularly from Ceylon. Para rubber seems to have steadied down to normal prices after a period of unsteadiness on account of conditions on the Amazon River.

Standard Parts Stock Issue

CLEVELAND, OHIO, Nov. 25—The Maynard H. Murch Co., investment broker,, is offering a new issue of 7 per cent cumulative tax free preferred stock of the Standard Parts Co., the consolidation of the Perfection Spring Co. and the Standard Welding Co. Par is $100 a share and the dividend periods are March, June, September and December. Of the authorized capital of $10,000,000 preferred, $5,000,000 is to be issued and of the authorized issue of $25,000,000 common only $8,000,000 is to be issued at this time.

White Wants Tax Reduction

CLEVELAND, Nov. 24—County Auditor Zangerle added $5,000,000 to the White company's statement, claiming this to be good will. The company asks for a reduction of valuation amounting to $13,071,000, which the auditor has refused to make.

Metz Makes Welfare Improvements

WALTHAM, MASS., Nov. 24—The Metz Co., this city, has formulated plans for the social benefit of its employees. A clubhouse, athletic field and the freedom to a tract of 147 acres of land are included under the new welfare policy. There is also in contemplation a gymnasium, a separate baseball field, and ½-mile track, which will probably be built in the spring. An adjoining building to the executive and sales force

offices, is now being converted into an engineers' club.

Production at the plant has been increased 40 per cent, and now the capacity is more than 100 cars a day.

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Bonus for Westinghouse Employees

PITTSBURGH, PA., Nov. 24—Employees of the Westinghouse Electric & Mfg. Co., this city, have been granted an extension of their present bonus system which is to include salaried and office employees on hourly rates, by which they will receive a bonus of 8 per cent of their salary each month, providing their total excusable time absent and late during the month does not exceed 6 hr. incurred on not over three occasions.

An additional 4 per cent will be given each month to employees who have not lost any time from work during the month through absence or tardiness.

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Automobile Lock Co. Incorporates

GRAND RAPIDS, MICH., Nov. 24—The S. & S. Auto Lock Co. has been incorporated for $20,000. Incorporators are E. W. Slausson, W. B. Brown and A. M. Freeland.

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Disbrow Motors Co. Organized

CLEVELAND, Nov. 24—The Disbrow Motors Co. has been organized with a capitalization of $25,000. Incorporators are Louis Disbrow, W. D. Callinan, M. Becker, M. L. Fisher and A. B. Crowell.

Automobile Issues Fluctuate

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Lower Than Last Week—General Motors and Chevrolet Lead Decline

NEW YORK CITY, Nov. 27—Automobile and accessory issues on Saturday closed lower though stronger than on the previous Saturday. There has been a lot of covering in the motor shares during the last few days. Their position had grown strong during the early part of the week as a result of too much enthusiasm on the short side. Motor issues, it seems, are usually in fair demand when other industrials are depressed, and vice versa.

Chalmers and General Motors were the features last week. Chalmers rose 4 points on its common and General Motors dropped 90 points after a similar gain in the previous week. Chalmers held strong despite the publicity given the stock on account of the short selling of its underwriting syndicate. Threats have been made that the handling of the stock would be brought to the attention of the governors of the stock exchange, but this did not affect the issue one way or the other.

The automobile and accessory issues have been on a down market for some time, but it is expected that as soon as the short sellers have their run, prices in general will rise to and above their old marks. Last week Chevrolet dropped 4 points to 172; Peerless dropped 2 points. A few gains were made, however, led by Chalmers, Chandler, Miller, Packard, Regal and Overland. Chalmers rose 4 points on its common; Chandler rose 4 points; Miller Rubber rose 5 points; Packard preferred rose 7 points; Regal, 5 points and Overland 5-8 points on its common and 3⅛ on its preferred.

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Barley Increases Wages

STREATOR, ILL., Nov. 27—The Barley Mfg. Co., Streator, Ill., maker of the Roamer and the Halladay, announced an increase in wages, or rather the operation of the plant on an 8-hr. basis with 10-hr. pay. In addition, there will be a bonus for the senior employees, etc.

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Dividends Declared

Stutz Motor Car Co. of America, $1.25-100 per share, payable Jan. 2, 1917, to stock of Dec. 15. Mitchell Motors Co., $1.50 per share to stock of record of Nov. 10, payable Nov. 24.

Morgan & Wright, coupon due Dec. 1 upon 5 per cent gold debentures is payable upon presentation at the Industrial Trust Co., Providence, R. I., or the Chase National Bank, New York.

Texas Co., $2.50 per share on outstanding capital stock, payable Dec. 31 to stock of record Nov. 29.

C. M. Hall Lamp Co., quarterly of 2 per cent.

Packard Motor Car Co., quarterly of 1¾ per cent, payable Dec. 15.

Automobile Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Week's Ch'ge
Ajax Rubber Co.	70	72	—3½
J. I. Case T. M. Co. pfd.	87	88	—1
Chalmers Motor Co. com.	134	150	+4
Chalmers Motor Co. pfd.	111	114	+1
*Chandler Motor Car Co.	110	112	+4
Chevrolet Motor Co.	172	180	—4
Fisher Body Corp.	38	42	..
Fisk Rubber Co. com.	80	90	..
Fisk Rubber Co. 1st pfd.	100	110	—9
Fisk Rubber Co. 2d pfd.	90	100	—5
Firestone Tire & Rubber Co. (new com.)	168	171	..
Firestone Tire & Rubber Co. pfd.	106	108	..
*General Motors Co. com.	510	875	—90
*General Motors Co. pfd.	120	123	..
*B. F. Goodrich Co. com.	70½	71	+ ¼
*B. F. Goodrich Co. pfd.	113½	114	..
Goodyear Tire & Rubber Co. com.	294	297	—1
Goodyear Tire & Rubber Co. pfd.	108½	109½	— ½
Grant Motor Car Corp.	8	9½	+1
Hupp Motor Car Corp. com.	4	5	— ½
Hupp Motor Car Corp. pfd.	80	95	—5
International Motor Co. com.	5	8	..
International Motor Co. pfd.	23	..	+1
*Kelly-Springfield Tire Co. com.	76¼	77¾	— ¾
*Kelly-Springfield Tire Co. 1st pfd.	96	99½	..
Keystone Tire & Rubber Co. com.	15¾	16	..
*Lee Rubber & Tire Corp.	38¼	39	—1¼
*Maxwell Motor Co. com.	74	74⅛	—2
*Maxwell Motor Co. 1st pfd.	81¾	82	+ ½
*Maxwell Motor Co. 2d pfd.	49½	50¼	— ½
Miller Rubber Co. com.	255	260	+5
Miller Rubber Co. pfd.	107	108	+1
Mitchell Motors Co.	59	60½	..
Packard Motor Car Co. com.	173	176	..
Packard Motor Car Co. pfd.	101	103	+7
National Auto Corp.	..	..	..
Paige-Detroit Motor Car Co.	38	38¾	— ½
Peerless Truck & Motor Corp.	21	23	—2
Portage Rubber Co.	165	170	..
Regal Motor Car Co. pfd.	25	35	+5
Reo Motor Car Co.	45½	46½	— ½
A. O. Smith Corp. com.	78	79	..
A. O. Smith Corp. pfd.	96¾	97	+ ¾
Saxon Motor Car Corp.	78	80	— ¾
Spicer Mfg. Co.	47¼	47¾	— ⅝
Springfield Body Corp. com.	90	95	..
Springfield Body Corp. pfd.	120	130	..
Smith Motor Truck Co.	6⅛	6¼	— ⅝
Standard Motor Construction Co.	7	7½	..
Stewart Warner Speed. Corp. com.	106	108	—1
Stewart Warner Speed. Corp. pfd.	..	..	..
*Studebaker Corp. com.	124	124¾	— ½
*Studebaker Corp. pfd.	109¼	110	..
Stutz Motor	65	65⅛	..
Swinehart Tire & Rubber Co.	85	89	—1
United Motors Corp.	61½	62	— ¾
*U. S. Rubber Co. com.	65¾	66¼	+3¾
*U. S. Rubber Co. pfd.	112¼	113	— ⅜
White Motor Co.	54	54¾	— ⅜
*Willys-Overland Co. com.	38½	38¾	+ ⅝
*Willys-Overland Co. pfd.	98⅜	98½	+3⅛

*At close Nov. 25, 1916. Listed New York Stock Exchange.
Quotations by John Burnham & Co.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Auto Body Co.	45	48	+ ½
Chalmers Motor Co. com.	140	150	+10
Chalmers Motor Co. pfd.	112	..	+2
Continental Motor Co. com.	41½	42¼	+1½
Continental Motor Co. pfd.	9¾	10¼	+ ¼
Ford Motor Co. of Canada	293	305	+3
General Motors Co. com.	..	825	..
General Motors Co. pfd.	118	122	—5
Maxwell Motor Co. com.	74	77	— ½
Maxwell Motor Co. 1st pfd.	80	83	— ½
Maxwell Motor Co. 2nd pfd.	48	51	—1
Packard Motor Car Co. com.	172	176	..
Packard Motor Car Co. pfd.	104	..	+4
Paige-Detroit Motor Car Co.	38¼	..	— ¼
W. J. Prudden Co.	49	50	..
Reo Motor Car Co.	45	45¾	— ½
Studebaker Corp. com.	124½	127	— ½
Studebaker Corp. pfd.	107	..	—1
C. M. Hall Lamp Co.	29½	..	..

INACTIVE STOCKS

Atlas Drop Forge Co.	..	33	..
Kelsey Wheel Co.	55	60	..
Regal Motor Car Co. pfd.	25	..	..

$14,000,000 Dealer Merger

Aaron De Roy Co. Combines with Studebaker Sales Co. of Ohio—Contract Enlarged

DETROIT, Nov. 27—The Aaron De Roy Motor Car Co., distributer of Studebaker cars for Pittsburgh and western Pennsylvania, has merged with the Studebaker Sales Co. of Ohio. The Studebaker Sales Co. was incorporated in September and combined the Blevins Auto Sales Co. of Toledo and the A. R. Davis Motor Co. of Cleveland, so that the new merger includes three of the largest Studebaker distributers. The original contract between the Studebaker Corp. and the Studebaker Sales Co. called for $12,000,000 worth of cars. With the new merger the contract has been changed to $14,000,000, and is the largest single contract made in the history of the industry.

—

Baker Takes Atlantic and Horner

BOSTON, Nov. 25—Day Baker, one of the pioneers of the electric field in New England, who resigned recently as an executive of the General Vehicle Co. at New York, has taken on the Atlantic electric and the Horner gasoline trucks for New England.

—

Leavitt Will Handle Columbia

DETROIT, Nov. 25—J. W. Leavitt will handle the Columbia car for the Pacific coast and is making his preliminary plans for a large campaign.

—

Westinghouse Makes A.B.C. Starter Contract

DETROIT, Nov. 25—The Westinghouse Electric Co. has closed a contract for $250,000 worth of electrical supplies with the A.B.C. Starter Co.

—

Auto Specialties Gets Overland Contract

DETROIT, Nov. 24—The Willys-Overland Co. has contracted with the Auto Specialties Co., St. Joseph, Mich., for 300,000 Bair automobile top holders.

—

Kline in New York

NEW YORK, Nov. 27—The Kline Car is now handled in this city by the W. S. Roberts Motor Corp., 1838 Broadway, at Sixtieth Street.

—

Hassler Motor Co. Formed

INDIANAPOLIS, Nov. 27—The Hassler Motor Co., this city, has been incorporated with a capitalization of $200,000, the incorporation papers stating that the company will manufacture automobiles. R. H. Hassler, head of Robert H. Hassler, Inc., manufacturer of automobile parts, who heads the new company, declined to make any announcement of the company's plans, stating that the plans would be announced in the near future. The incorporators, in addition to Mr. Hassler, are E. D. Fouts and D. G. Ong.

—

Gillam Increases Capital to $800,000

DETROIT, Nov. 28—The Gillam Mfg. Co. has voted to increase its capital stock from $350,000 to $800,000. An issue of $225,000 7 per cent cumulative preferred stock was authorized and has already been subscribed for by present stockholders and others. The company will erect a building for malleable iron manufacture and one for semi-steel work to meet the increasing demand for its products.

—

Wright Adapter Now Western

SEATTLE, WASH., Nov. 27—An agreement has been reached by the Wright Truck Attachment Co. and the Truck Attachment Co., both manufacturing Ford truck adapters under the name Wright, under which the former concern becomes the Western Truck Attachment Co. and its product the Western attachment.

—

Acme Truck Maker to Add

CADILLAC, MICH., Nov. 27—The Cadillac Auto Truck Co., this city, maker of the Acme 1 and 2 ton trucks, will soon add to its factory a new concrete, steel and brick building 96 by 176 ft. The new 3½-ton model is well under way.

—

Universal to Organize Subsidiaries

DETROIT, Nov. 27—The Universal Valveless Four Cycle Motor Co. will move from Grand Rapids to Muskegon, establishing a plant there, with C. E. Johnson president, and will organize subsidiary companies to manufacture its motor. The parent company will have a capitalization of $250,000.

—

New Era Increases Factory

DETROIT, Nov. 24—The New Era Spring & Specialty Co. has increased its productive facilities at Grand Rapids by the purchase of the Ruskin Biscuit plant, which is to be remodeled immediately. The company will maintain its main salesrooms at Detroit.

—

Trucks Carry U. S. Munitions

EL PASO, TEX., Nov. 27—Motor trucks transported the trainload of shrapnel and cannon shells recently received here to Colonia Dublan, the advanced base. There were twenty-seven box cars of ammunition, containing 67,500 shells, packed four to a case.

Kemco Starter Under Hood

Type of Mounting on Ford Crankshaft in Front of Radiator Abandoned

NEW YORK, Nov. 28—The Kemco Electric Mfg. Co., Cleveland, has changed its starting motor for Ford cars so that it will be located under the hood instead of on the crankshaft in front of the radiator, as heretofore. The construction of the motor has undergone no decisive change, although it is somewhat smaller and lighter. It will be installed at the right of the engine and bolted firmly to a casting which takes the place of the front plate on the Ford engine, this casting also being employed as a bracket for the generator. The drive will be by sprockets and roller chain direct to the crankshaft. The fan-type generator will remain unchanged with the exception of its connection with the starting motor, the drive being direct to the crankshaft instead of through the jackshaft assembly.

—

Chevrolet 6000 Cars Behind Orders

DETROIT, Nov. 27—The Chevrolet Motor Co. will close November 6000 cars behind on deliveries on the month's business alone. The scheduled output for December is 10,000 cars. The company reports an export business that will probably amount to 10,000 cars for 1916.

—

Taylor Timken Advertising Manager

DETROIT, Nov. 28—W. H. Taylor has been appointed advertising manager of the Timken Roller Bearing Co., this city. Mr. Taylor was formerly with the Campbell Ewald Co. advertising agency in this city.

—

Chain of Disco Branches

DETROIT, Nov. 28—The Disco Starter Co. shortly will establish a chain of branches in the larger cities by way of facilitating the administration of service to owners. The first branches will be located in New York and Chicago.

—

New Champion Delivery Chassis

CHICAGO, Nov. 27—To manufacture ½- and ¾-ton delivery chassis the Champion Motors Co. has been formed by Cleveland interests in Fulton, Ill. The vehicles will have electric starting and lighting, bumpers, side curtains and other detail refinements. They will sell for from $750 to $775.

The plans of the company were first made public last Saturday, when ten of the new chassis were paraded down the

main streets of Fulton to arouse public enthusiasm.

W. L. Widlar, N. R. Wildman and William Greif head the concern, which has a capital of $5,000,000. Mr. Widlar is interested in several accessory, lumber, real estate and steamship companies, and is president of the Champion company. Mr. Wildman, vice-president, is a financier of large interests, and Mr. Greif, secretary and treasurer, is heavily interested in a number of Cleveland manufacturing concerns. H. D. W. Mackaye is vice-president in charge of production and designer of the chassis. He has been employed by the Mora, Jenkins, Croxton-Keeton, Metzger, King and Keeton companies.

—

N. A. C. C.'s New Dealers' Arrangement for National Shows

NEW YORK, Nov. 27—The dealer arrangements for the national shows in New York and Chicago have been considerably simplified. Manufacturers will supply lists of dealers, and these lists will be checked and so blended that the name of a dealer cannot appear more than once. This means that if a dealer handles several lines of cars his name will appear but once instead of several times, as in the past. To each of these dealers will be sent three single admissions for his personal use. Dealers in important cities will receive three additional tickets, also intended for their personal use. In addition to these tickets, which will be sent direct to the dealers, each exhibiting member of the N. A. C. C. will receive a limited number of blank tickets to be distributed by the dealer to his representatives.

—

Three More Accessory Exhibitors

NEW YORK, Nov. 28—The Motor and Accessory Manufacturers have allotted space to three more accessory manufacturers for the New York and Chicago national automobile shows. This makes the total 343. They are: The Syracuse Malleable Iron Works, Syracuse, N. Y., maker of axles and castings; the Universal Motor Products Co., Indianapolis, winter tops for Fords, at both shows, and the Ericsson Mfg. Co., Buffalo, maker of the Berling magneto, at New York only.

—

New Era Buys Accelerator

DETROIT, Nov. 27—The New Era Spring & Specialty Co. has purchased the Ford foot accelerator formerly manufactured by H. E. Petrie of Battle Creek. About $8,000 was involved in the transaction.

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Specialty Mfg. Co. Organized

DETROIT, Nov. 24—The Specialty Mfg. Co. has been organized at Minerva, Ohio, to make automobile accessories.

Drivers To Build Racing Cars

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De Palma, Rickenbacher and Chevrolet Will Manufacture Machines in Detroit

DETROIT, Nov. 27—De Palma, Rickenbacher and Chevrolet are going to manufacture racing cars for their own use in the 1917 speedway campaign. Rickenbacher, who is entered in Los Angeles for the 150-mile Ascot race, will come to Detroit to build a team of racing cars to be owned by W. Weightman, III, of Kenova, W. Va. Chevrolet will work over the three Frontenac cars built jointly by himself and Joseph Boyer, Jr., this year. De Palma will devote himself to the De Palma Mfg. Co., which is to build special speedsters for those who want cars of that type.

—

Two Killed at Uniontown Speedway Practice

UNIONTOWN, PA., Nov. 27—C. M. Heist of Sharpsburg, Pa., and F. E. Bush of Pittsburgh, his mechanician, were killed to-day while traveling 60 m.p.h. on the local automobile speedway in preparation for qualification tests for the race on Thanksgiving Day. The front axle of the car broke.

—

Swiss Magneto Moves to Monroe

MONROE, MICH., Nov. 25—The Swiss Magneto Co., manufacturer of Swiss high-tension magnetos, has moved from Chicago to this city, having bought out the Elkhart Mfg. Co., and now occupies its factory. The new facilities will enable the production of Swiss magnetos to be considerably increased. No change in personnel will be made. The manufacture of Elkhart magnetos, which were the product of the Elkhart company, will be discontinued, it is understood.

—

Issue Gasoline Cards in France

PARIS, FRANCE, Nov. 23—Gasoline tickets and a ban on the use of private automobiles, it is stated, is part of a scheme in this country, for regulating the consumption of food and other supplies. If necessary, the government will forbid the running of any automobiles except public or semi-public machines.

—

104 Cars Burned in St. Louis

ST. LOUIS, Nov. 28—One hundred and four Overland cars were destroyed here yesterday in a fire in a wing of the warehouse of the Cedar Street Warehouse and Storage House. The machines were the property of the Willys-Overland Co. and were insured through the Toledo office. All were intended for Southwestern distribution. The local distributer says that the loss will not cause immediate inconvenience. Eight hundred additional cars of various makes in the main storage house were saved by closing of fire doors.

—

White Detroit Battery Sales Mgr.

DETROIT, Nov. 28—C. E. White has become sales manager of the Detroit Battery Co., this city. He was formerly connected with the General Electric Co.

—

King Trailer Co. Formed

ANN ARBOR, MICH., Nov. 28—The King Trailer Co., this city, has been organized to make trailers and has purchased outright the Ann Arbor Buggy Co. L. C. Long is vice-president and city sales manager of the Chicago branch of the Federal Motor Truck Co. He was formerly New England sales manager for this company.

—

Victor Motor in Jenkintown

WILMINGTON, DEL., Nov. 27—The Victor Motor Co., which recently purchased land at Claymont, Del., for a plant, has decided to locate at Jenkintown, Pa.

—

Manly Truck in New Plant

CHICAGO, Nov. 27—A new factory in Waukegan, Ill., a short distance north of here along the lake shore, has been secured by the Manly Motor Truck Co., which recently put the Manly truck on the market. Tht new plant will be occupied about Dec. 1.

—

Marvel Accessories Capital Increased

CLEVELAND, Nov. 27—The Marvel Accessories Mfg. Co. has increased its capitalization to $100,000, and a new factory building, which will greatly increase output, is now under construction. When completed more than 45,000 sq. ft. of floorspace will be available.

—

Logan Leaves Logan-Fischer Co.

CLEVELAND, Nov. 24—C. M. Logan, president of the Logan-Fischer Motor Co., Chalmers distributors, is severing his connection with that firm.

—

Hupmobile Tour Reaches Santa Fé

DETROIT, Nov. 27—The Hupmobile capital-to-capital party reached Santa Fé, the thirty-fourth capital in its journey, on Nov. 23. The car is now on its way to Phoenix, Ariz.

—

Stern-wear Tubes on Market Dec. 1

ST. LOUIS, Nov. 27—The Efficiency Oil Corp., of this city, announces that Stern-wear inner tubes, guaranteed to wear 20,000 miles, will be placed on the market from the new factory here Dec. 1.

The Automobile

PUBLISHED WEEKLY

Vol. XXXV Thursday, November 30, 1916 No. 22

THE CLASS JOURNAL COMPANY

Horace M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
A. B. Swetland, General Manager
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SUBSCRIPTION RATES

United States and Mexico ---------- One Year, $3.00
Canada ---------- One Year, 5.00
Foreign Countries ---------- One Year, 6.00

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Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

Bed Rock

THE way in which automobile engineers this year have shown an inclination to get to the real bottom of subjects is very encouraging. There are many things in connection with automobile engineering that have been haphazard and rule of thumb, and they are mostly things that have been good enough in the past but are not good enough now, other parts of the chassis being improved so greatly. Such an example is the paper on retardation printed on another page, for it deals with primary forces and touches not at all on mechanical detail. Another constant subject of discussion during the year has been crankshaft balance, mainly a theoretical subject, the theory being forced upon us by the obvious imperfection of older designs.

There are many other things; lubrication is one, carburetion another and spring action a third, which may be mentioned as matters which require much more scientific treatment, and it would be easy to extend the list. The great thing, however, is not so much what has been done and is doing now, but the spirit of the thing. These discussions are lifting automobile engineering up to a higher plane; they mean that the automobile engineer of the future will need as good a scientific training as any other.

In its infancy the automobile industry was looked down upon by other branches of engineering because it had no theoretical basis; and in very truth it was once all a cut and try proposition. This is no longer so, and the cut and try methods of design and manufacture are dying, surely if not yet, very rapidly.

The automobile has really created a new section of engineering much broader than the road vehicle field. It has created the engineering of light structures, the engineering of weight saving. From the motor car chassis the aeroplane has grown, the high-speed boat has come into being and even railway engineering has felt the influence. This influence is but at its beginning. In the future we shall see much more machinery economical in use because light in weight, and all of it should go to the credit of automobile engineering. Let the good work go on.

Generator Reliability

THE only attention now needed by the electrical equipment of an automobile is the regular examination of the battery and occasional oiling of the generator and motor bearings. Adjustments of any kind are hardly ever provided by generator manufacturers, and they all state with emphasis that the less the owner knows of the existence of the commutator and brushes the better.

A generator and a starting motor should have an expert examination every 20,000 miles or so, or if they give trouble, but nearly every trouble that can occur happens outside the generator, which is about the most reliable part of the whole equipment.

Manufacturers list their troubles with generators as due to three things, over lubrication, under lubrication and "tinkering." Other troubles are all traceable to some accidental fault in manufacture and are correspondingly extremely rare. The reason for this is that the modern electric generator is extremely simple. It is far simpler than a magneto, for example. It did not take the public long to realize that any ignition trouble within a magneto was so rare that it need hardly be considered, and they would tackle spark plugs and wiring many times before commencing to investigate the internals of the magneto. Slowly, the same thing is becoming true of the electrical equipment; the generator is being suspected last of all.

Needs Little Attention

Like a magneto a generator is designed to run without attention, and there is no attention that can be given it which will help it to run properly beyond frequent, gentle lubrication. Its brushes require attention far less often than even the breaker points of a magneto, and when they do need touching it is usually a case of renewal rather than of adjustment. Never touch a generator until every detail of the battery and the wiring has been tested, not once, but several times, and thoroughly at that. This will be found the best policy at all times.

Commutator sanding and the fitting of new brushes are jobs that have to be done at rare intervals and they are not difficult, but they should never be attempted by anyone who has not been shown how by some man with experience in this work, otherwise the last state of the commutator may easily be much worse than the first.

Electric Systems Simpler

Better Manufacturing Feature of Starting and Lighting Equipment Progress in Year—Fewer Types Electrically and Mechanically — Two-Unit Gaining Steadily — More Generators with Ignition Combined—General Reduction in Weight

By A. Ludlow Clayden

THERE has been no really large change in the design of lighting, starting and ignition apparatus during the year of 1916. Every trend seen last year is seen again at present. The starting motor itself is almost eliminated from this discussion because it is so extremely simple that changes in its electrical makeup are unthinkable. The generator is becoming a better manufacturing proposition as the different big producers tool up for more and more each, of a decreasing number of models, for the innumerable patterns and designs each "special" in some way that the leaders of the industry were being forced to make two years ago, have been cut down and down again till unreasonable modifications are a minimum. The time is not far off when the generator business will be as standardized as carbureter manufacture. This is the case already in some plants, where the owners have had the courage to say to the automobile industry, "Gentlemen, here are our models of generator, we would like to have you choose one, but if none will suit you then please take your business to some other plant." Other plants not quite so courageous have gone a part of the way and persuaded some of their customers to give up needless petty individualities.

Concentration on Types

There is another thing, too, that has had an effect in improving the factory conditions, and this is that the electrical firms have been able to pick the types on which to concentrate. Some of the largest makers very wisely have been making machines of several different electrical systems. These they have sold in thousands and they have their records in service. In this way the most reliable out of two or three systems is quickly discovered, and a firm can concentrate on one system without any fear that they may not have made the best choice. The mere matter of size of generator had to be settled by time and experience, and we can see now that many machines being made two years ago were larger and heavier than they needed to have been. We have arrived at the light-weight generator by a series of successive easy stage reductions in dimensions. The substitution of press work and stamped parts for castings and forgings has enabled pounds of weight to be saved, but it has taken time to obtain and install the necessary presses, so here again a tendency observed last year is seen intensified at the present time.

Two-Unit Systems Almost Universal

It has become an accepted fact now that there are limits of rotative speed beyond which it is uneconomical to drive an armature, so this practically confines the single unit dynamotor with a constant gear connection with the crankshaft, to fairly slow speed engines. In cases where the engine runs upward of 2000 r.p.m. it is rare to find anything except two unit systems, excepting those few single units which have one connection to the crankshaft while being driven and another of lower ratio when they are operating as the starting motor.

For starting motor drives the Bendix pinion is still the almost universal equipment and it is unlikely that this eminently efficient and simple device will be displaced for a long time to come. Magnetic shifts are used on a few cars and mechanical shifts have not disappeared altogether, but there are very few of these remaining.

A matter which is still very much in the air is that of the attachment of the generator and the starting motor to the crankcase. At first almost all generators were designed to fit on a platform after the fashion of the magneto. Next, came round body generators which were clipped in cradles cast on the side of the crankcase and, finally, we now have the flange type of generator or motor, which has a large flange with three or four bolt holes on one end of the frame, attaching to a machined surface on the back of the crankcase front end, in the case of the generator, and to a facing on the crankcase rear arm in the case of the motor.

This flange mounting is every bit as secure as the platform or cradle mountings, especially with the present-day low weight of electrical units, and it is cheaper for the automobile manufacturer, because on a crankcase there are already several surfaces which have to be machined into planes at right angles to the axis of the crankshaft and it is little trouble to machine the necessary extra two faces for the generator and motor. The armatures of these two machines must be parallel to the crankshaft, and with a platform mounting some precautions in fitting have to be taken to insure the parallelism, thereby making the crankcase machining a little more expensive.

Flange Mounting Not Always Possible

A trouble, which is retarding the adoption of flange mountings more generally, is that it is not always possible to adapt this style to existing engines without alterations in the design of the crankcase. A committee of the Society of Automobile Engineers is investigating the situation, and has been doing so far nearly a year, and it has discovered a strong tendency amongst engine builders to make their new models suitable for flange mountings. This being so the S. A. E. expects that it will be able to standardize three flanges of different sizes, and that these standard ends for generators and motors will come steadily into use; though it may take some years for this to happen in cases where engine design has first to be changed.

One big advantage of the flange mounting is that it permits adjustment of the centers in the front end. If the flange has one round hole and two slotted holes it can be swung a little on one of the bolts, so allowing adjustment of the degree of mesh of the front end gears, or even effecting adjustment of the chain where a chain drive is employed for the generator. The starting motor does not need this adjustment, and may therefore have a standard flange somewhat different from that for the generator. The trend toward the use of the flange has begun and one of the largest suppliers is putting on all possible pressure to have it adopted by every one of its customers, but it will need another year yet before the work now being done by the electrical firms will show its effect to the full as they are pushing for flange mountings on the 1918 cars rather than for 1917 business, which is practically all closed.

Unit Ignition Increasing

The trend toward unit assemblies of generators with ignition distributers is very marked this year. Not only does this eliminate one of the drives from the engine, but with a normal sort of generator location it usually brings the distributer into a position somewhere nearly midway of the cylinders, so that the high-tension leads to the spark plugs can be short and direct. There is another small advantage, in that the timing can usually be made very exact, because the pitch of the fine teeth of the bevel or spiral gear drive for the vertical shaft will differ from that of the front end gear, thus offering a chance for a sort of differential setting.

The manufacturers of generators do not appear to have any preference with respect to the location of the ignition distributer. The demand for combining it with the generator appears to have come from the automobile manufacturer and it depends upon him whether this will be the most common type in the future. One tendency with respect to ignition units is worth noting. Two years ago a number of generators were being put out with the ignition breaker and distributer mounted on the end and appearing from the outside almost exactly the same as a magneto distributer. These types are still being made, but they are not being used to anything like the same extent as are the generators combined with a cylindrical distributer on a vertical shaft.

There are two reasons which may explain this situation. The first is that the provision of a vertical shaft on the end of a generator will allow a number of different kinds of distributers to be fitted, so a manufacturer need not purchase the generator and the ignition device from the same firm, even if he uses them in unit combination. The other is that the cylindrical distributer on the vertical shaft is usually less liable to be rendered inaccessible by manifolds or other parts on an engine.

There is another point which is sometimes of importance in determining the choice of a unit generator and igniter. With the magneto type of distributer and contact breaker it is not usually so easy to carry the armature shaft out at both ends of the generator. When the vertical distributer is used it is quite easy to extend the armature shaft so that a water pump or some other accessory can be driven tandem with the generator. With a flange mounting for the generator and an armature shaft carried right through, a drive for a tire pump can be arranged very conveniently and the pump will not interfere with the accessibility of the distributer.

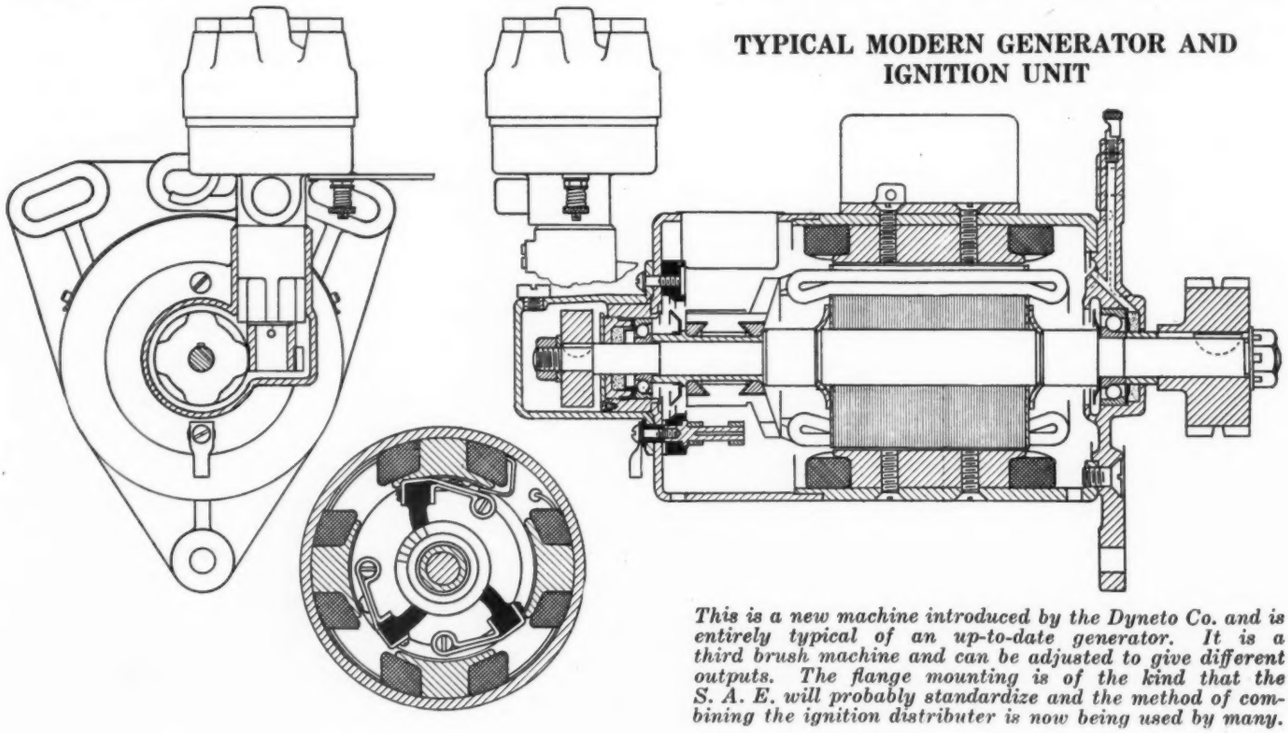
Fewer Regulating Systems

For holding the voltage steady throughout a very wide range of armature speed a large number of different schemes have been tried. Three years ago there was very little indication as to what would be the ultimate choice of manufacturers. Even a year ago it would have been hard to forecast the situation to-day, but it is now possible to state quite definitely that the third brush system of regulation is far the most popular and that the vibrator controller for either voltage direct or for current is second favorite.

It also appears now that we shall almost certainly see several systems of regulation continuing in use for many years. For very many purposes it is hardly possible to improve upon the third brush system. For cars having a big lamp load, a rather lighter machine can be built with a vibrator control, while the bucking coil and some other system of control are often preferred in special cases.

The action of the different controlling systems has been explained several times in THE AUTOMOBILE, but the two

TYPICAL MODERN GENERATOR AND IGNITION UNIT

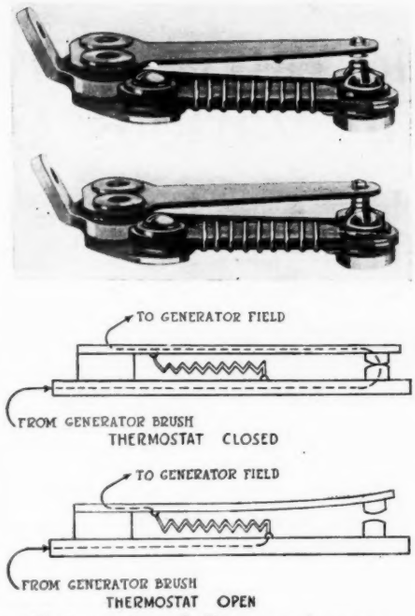


This is a new machine introduced by the Dyneto Co. and is entirely typical of an up-to-date generator. It is a third brush machine and can be adjusted to give different outputs. The flange mounting is of the kind that the S. A. E. will probably standardize and the method of combining the ignition distributer is now being used by many.

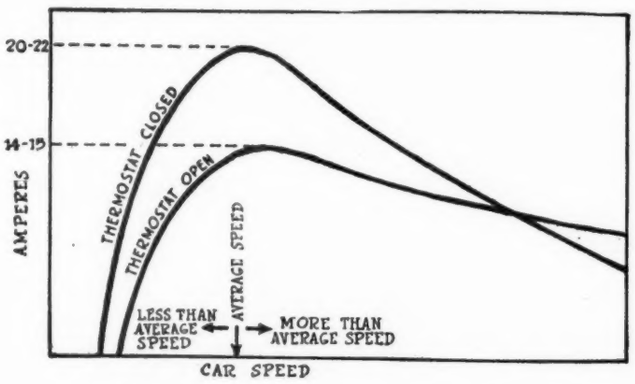
principal controls may be outlined briefly once again. There are two main brushes on the generator from which the current is taken and this current has two paths. One is the outside path to the battery, etc., the other is the internal path round the field magnets. Now, if we assume that there is 6 volts difference of potential between the main brushes we could regard one brush as being plus three and the other brush as minus three. If we apply a third brush midway between these two its potential would be zero. If, therefore, we take a wire from the third brush, wrap it around the poles of the field magnet and take it back to either of the two main brushes there will be a difference of 3 volts between the two ends of this secondary field magnet winding. This means that a current will flow through this second winding as well as through the main winding.

As the speed of the armature varies the magnetic lines of force are distorted. At very low speed they go straight from pole to pole and as the speed rises they are dragged around by the armature so that they take up an angular position. The effect of this is to vary the potential at the point on the commutator where the third brush makes contact, so that the current flowing from the third brush to whichever of the main brushes it may be connected varies with the speed of the machine. It is possible so to place the third brush that the current from it will assist the excitation of the field magnets at low speeds and oppose it at high speeds.

The action may be compared to that of a fan placed in a flue from a stove. When the stove is burning freely we can set a fan to blow up the flue, thereby increasing the draft and



Photograph and diagram of connections for Remy automatic output regulating thermostat



Effect of Remy thermostatic output control

encouraging the fire. When the fire is burning freely so that the natural draft up the flue is very strong, we could decrease the rapidity of the draft by reversing the direction of the fan and blowing *down* the flue instead of *up* it.

It is obvious that, with this third brush system, the exact nature of the current produced from any one machine will depend upon the position of the third brush relative to the other two. If we want the generator to start charging at a very low speed we can set the third brush so that the current from it will assist the magnetization of the fields very strongly. If we want to reach the peak of the output of the generator at a higher speed we can move the brush so as to reduce or even entirely remove the assisting feature, letting it act only in opposition at high speeds. Thus the third brush machine has a possibility for adjustment. Nearly all third brush machines are so made that the manufacturer can adjust it, but very few indeed have an adjustment which is intended to be touched outside the factory. The reason for this is that the adjustment must be operated intelligently. It is a useless thing to anyone who does not understand its function. It used to be thought that the difference in the average lamp load between summer and winter would make an adjustment imperative, but this idea has lost ground steadily and has few supporters to-day. The reason is two-fold; first, batteries will withstand a greater degree of overcharging than they used to do, and secondly, generators are commonly so constructed that they produce the maximum charging current at fairly low speed and considerably less current at high speed. This means that the reduction in speed which accompanies night driving actually increases current output. Furthermore, with some of the vibrator controls, the output of the generator depends only upon the condition of the battery and, if the battery is full, the generator will deliver very little current, scarcely more than enough just to keep the battery in proper condition.

The Remy company, however, considers that some sort of differentiation is required for the sake of the battery, and it has recently developed a very interesting device for varying the charging rate between summer and winter. If the generator is made so that it will carry the winter lamp load it is bound to do a certain amount of battery overcharging in the summer and, although this may not do the battery any real injury it is bound to evaporate the electrolyte a little quicker than it would otherwise do.

The Remy idea is very simple and it consists of an automatic device controlled by temperature which switches a resistance into the field windings as soon as the temperature of the generator rises above a predetermined point, usually about 150 deg. The device consists of a pair of contacts normally kept together, one of them being mounted on a compound strip of two dissimilar metals. When temperature increases above 150 deg. this strip bends, so breaking the contacts and thereby throwing in the additional resistance coil.

The thermostat is mounted inside the generator, where it will normally be at about the same temperature as that prevailing throughout the coils and body of the generator. It is proposed by the Remy company to proportion the additional resistance so that the effect of throwing it in is to reduce the current about 30 per cent. An automatic device

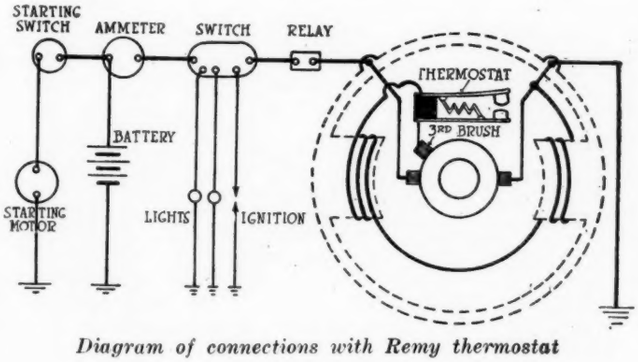
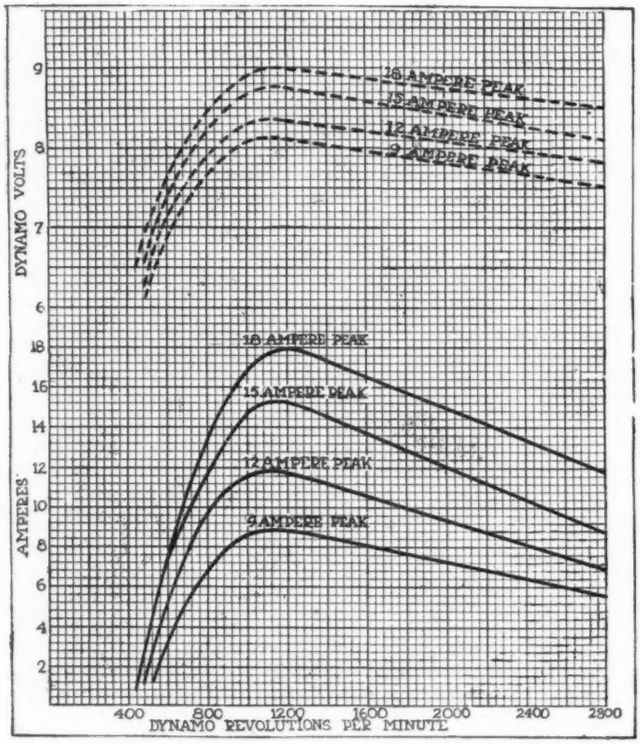
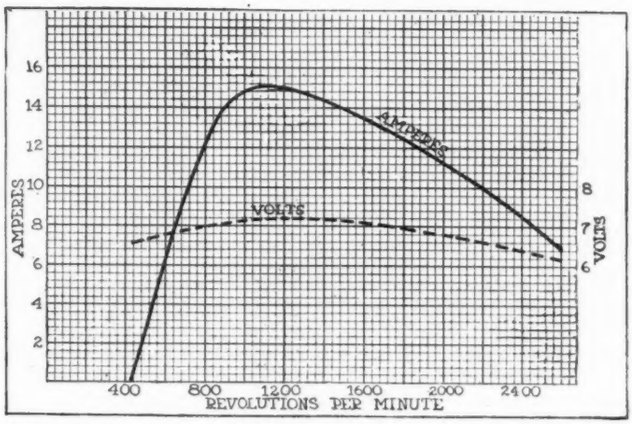


Diagram of connections with Remy thermostat

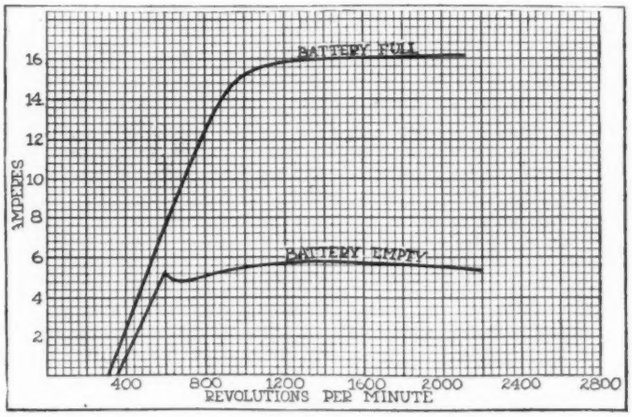
Characteristic Curves From Different Controls On Various Generators



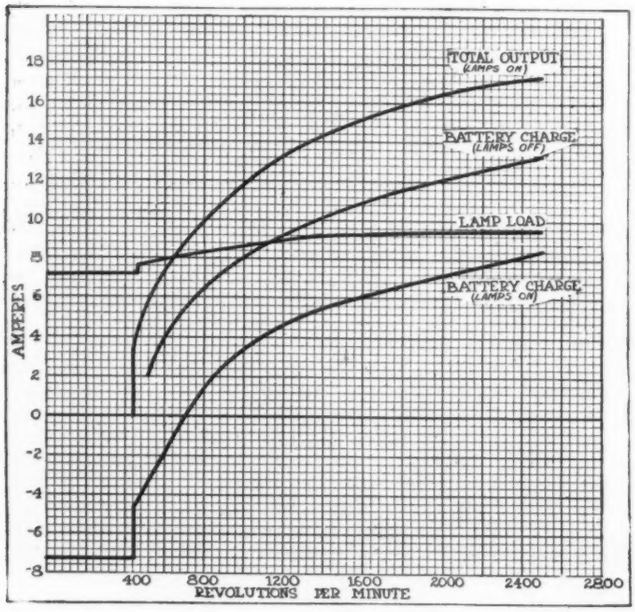
Voltage and ampere curves obtained from the same generator with third brush regulation obtained by altering the adjustment of the third brush. These give an excellent idea of the adaptability of this kind of regulation to various conditions, a very desirable feature



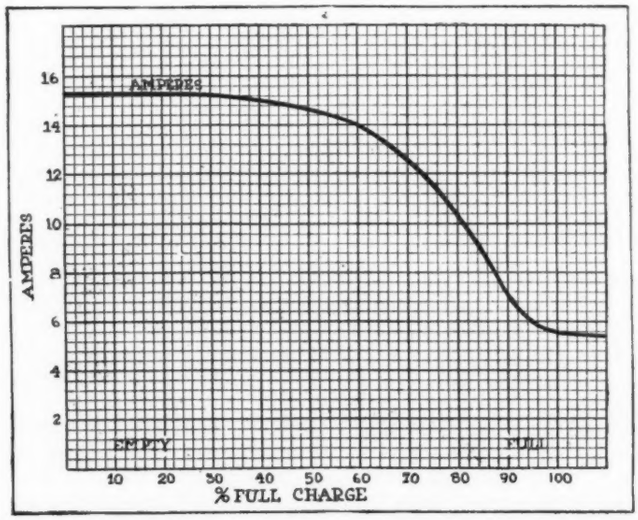
Characteristic curves from third brush generator plotted to a different scale



Shows how the state of charge of the battery affects the output from a generator with voltage regulation by vibrator



Bucking coil regulation curves showing characterictics, which, as may easily be seen by comparing them with the curves in the cuts appearing above, differ greatly from those of the third brush machine



Another way of showing the effect of the state of the battery on a voltage regulated generator. The curve is the output measured at successive intervals of time as the generator brings the battery from full discharge to full charge

of this nature should have the advantage over anything requiring manual operation.

Several generator makers give directions in their instruction books for hand adjustment of the third brush and recommend its use, so it is quite probable that automatic or hand settings will return to favor in course of time.

Vibrator Like a Throttle

Vibrator control operates quite differently from the third brush system. In its simplest form there is an ordinary shunt coil passing from one main brush to the other and no subsidiary winding on the pole pieces. The shunt winding is connected permanently to one brush and its connection to the second brush is controlled by the vibrator. This vibrator is a spring reed furnished with contacts and with a small electro-magnet. The coil of this magnet is placed somewhere in the circuit so that if the current in it increases above a certain point the reed is attracted and the contacts either made or broken. With the reed in one position there is direct connection of the second brush to the end of the shunt winding, which means that as much current as possible will be flowing around the magnet poles. If this current becomes too strong, the reed of the vibrator moves and the change in the contacts thus caused switches a resistance coil into the shunt circuit. The effect of this is instantly to reduce the amount of magnetization, which in turn reduces the current. As soon as the current drops the reed of the vibrator is released and flies up, thus cutting out the resistance and returning the state of affairs to what they were immediately beforehand. This action is performed with great rapidity and, returning to our stove analogy, it is as though there was a valve in the flue which automatically closed as soon as the draft passed a certain degree of vigor. The instant it shuts the draft ceases and the valve automatically reopens only to shut again as the draft increases once more.

The vibrator control was developed previous to the days of the automobile, being used for other electrical work, and it was its great reliability in this service which suggested the idea that it would be satisfactory for automobiles. It has proved wonderfully reliable and has the advantage that it can be assembled as a unit separate from the generator itself. The vibrating reed, the resistance coil and the little electro-magnet are commonly all mounted in a sealed case which is attached either to the body of the generator or to some other convenient point on the car, although mounting on the generator is the most usual method. In the rare event of anything going wrong, the whole control unit can be replaced as easily as changing a spark plug. Comparing the two systems, the third brush is the simpler and the cheaper to make. It has no parts which can possibly fail or give trouble excepting the brush itself. The two drawbacks are that the characteristic output curve is not quite so close to the ideal as can be obtained with vibrator regulation, and the fact that there are three brushes instead of two is bound to make a slight difference in the rapidity of commutator wear. These two drawbacks, however, are extremely small and can be largely offset by a slight increase in size.

Little to Choose Between Systems

The vibrator controls enable the generator to be somewhat smaller and lighter and usually they will bring a discharged battery back to the fully charged state most rapidly. The drawback, if indeed it can be called one, is the presence of a moving part and contacts which are made and broken constantly, but since the life of the vibrator is apparently very much greater than that of the brushes and other parts of the generator this is a very small point. Thus, in weighing up between the two systems, when you consider the type of output curve and the weight and the cost it will often be found that there is very little to choose.

A point which has been very much discussed is the car speed at which the generator should commence to charge. This, however, is of small importance by itself. It cannot be considered alone any more than we can consider the diameter of a valve without any knowledge as to its lift and timing. The essential thing is to have such a generator and to drive it at such a speed that we can be sure of an output equivalent to the full lamp and ignition load at an average night-driving road speed. The practice of various manufacturers differs a good deal, but almost all of them find it necessary to provide this amount of current at a speed of 15 m.p.h. Some of them consider 12 m.p.h. is better. In any case it is between 12 and 15 m.p.h. that something approaching the full output of the generator should be reached. How much below 12 m.p.h. the cut-in should take place depends upon the characteristics of the generator. That is to say, it depends upon how rapidly it comes up to full output.

May Raise Generator Speed

The great majority of generators are now geared to run one and one-half times crankshaft speed. Whether this is going to be conventional practice for many years is debatable. More than one manufacturer of electrical apparatus considers that an increase in armature speed would be desirable because it would permit the generator to be smaller and lighter. The limitations of speed are almost entirely mechanical. With an engine capable of revolving 3000 r.p.m. we must be certain that the armature commutator, etc., will withstand prolonged running at 4500 r.p.m. if we are going to us a 1½ to 1 ratio. Using a 2 to 1 ratio would mean that the armature would need to be safe at 6000 r.p.m. Manufacturers have had to discover methods of construction which enabled the armature to be manufactured conveniently and which also provided strength to resist the considerable centrifugal forces at these very high speeds. When the construction of an armature, consisting of bundles of wires wound round a peculiarly shaped piece of iron, is considered, the difficulty of resisting the disintegrating forces becomes apparent.

Self-Lubricating Bearing Popular

There is very little trouble with bearings, the loads are so light that these seem to be able to stand any number of revolutions. Ball bearings are used very extensively in mounting armatures, but there is a noticeable tendency towards the use of plain bearings and a most successful type has been a compound metal and graphite bushing. It is necessary with plain bearings to be sure of an adequate supply of oil, and this is usually arranged for by a form of lubricator in which sufficient oil for a month or two of running is carried in a little cup or reservoir and transferred to the bearing itself by a wick. The wick will always supply the same amount of oil per revolution, thus insuring an adequate supply and preventing an over supply. The electric manufacturers' service stations report that two of the commonest troubles are bearing trouble, caused by absence of oil, and commutator trouble, caused by too much oil. The average owner of an automobile either over-oils or under-oils it. Hence generator makers are trying, with good success, to devise forms of lubricators, like the wick lubricators, which make over-oiling impossible and carry so much oil that an adequate supply is guaranteed even if fresh oil is added only very occasionally. Several manufacturers have continued to use ball bearings because of their ability to run when quite dry, but the compound bushing containing a little graphite can also be run dry for a reasonable time without much damage resulting so that the present tendency is certainly toward plain bearings. This seems rather curious in these days when ball and roller bearings are being used more and more extensively, but there are two reasons which make the plain bearings preferable. One is that it is incapable of making any sound, and the other is that the clear-

ance between the armature and the pole pieces can be made rather smaller with plain bearings, which increases the electrical efficiency of the generator. However, we are getting small bearings of a greater and greater accuracy every year, so it will be very difficult to forecast what may be the eventual outcome.

Single Unit's Limited Field

The situation with respect to single-unit and two-unit systems is much the same as it was last year. That is to say, the trend toward the two-unit system is continued. The single unit which has but one driving connection to the crankshaft is giving excellent service and is still being used extensively on cars where the maximum of engine speed is not very great and where the cranking torque required is comparatively low. To give enough cranking torque a single unit in permanent connection with the crankshaft through a chain or gear has to be made larger than it would need to be did it operate as a generator only. It also has to run at a higher speed than would be the case were it only a generator. This is because the size and speed determine the cranking torque which the instrument can exert on the crankshaft.

Obviously, if we have a 3 to 1 gear ratio between the armature and the crankshaft we must have a much larger electrical machine than if we have a 20 to 1 ratio which is easily obtainable through the flywheel engagement.

This difficulty has been overcome in one or two cases by arranging a special form of drive so that the armature is driven at one speed when the machine is operating as a generator and at a much higher speed when acting as a motor. The best known example of this is, of course, the Delco system in which the armature is driven by the crankshaft from one end through an overrunning clutch and can be made to drive the flywheel from the other end, during which cranking period the clutch is in operation and the main drive is doing nothing, but electrically, this is practically the same thing as a two-unit system with the two units combined in one external casing. Possibly it is the great opportunities offered for patenting single-unit machines of this type and the impossibility of patenting two-unit outfits as such, which has encouraged the development of the two-unit system rather than of the "two speed" single unit. Undoubtedly, also, the two-unit system has been favored by automobile engineers because the generator is small and the motor so very small that it can be packed away in very little space.

As with almost every other new part of an automobile the design of the electrical equipment a few years ago was influenced largely by the demand for outfits which could be attached to engines originally designed to receive them. While this did not affect the electrical part very much, it did affect the mechanical detail profoundly, and it is really only now, at the commencement of the 1917 season, that it is possible to say the effects of this original influence have altogether vanished. Even now, however, very many generators and motors are being made to special designs because of the limitations imposed by the producers of old crankcase patterns. For instance, the inboard type of starting motor in which the Bendix pinion moves forward to engage the flywheel is simpler than the outboard pattern in which the pinion moves in the reverse direction, because in the former case it is only necessary to have the two bearings in the motor frame, whereas in the outboard type an additional casting with a third bearing the far side of the pinion is essential. It so happens, however, that the inboard type is difficult to apply to a good many stock engines with bell housing to the flywheel. Similarly with regard to the mounting of the generator, the geared centers in the front end fall very differently in different engines and this makes it hard to avoid the occasional use of special generator frames.

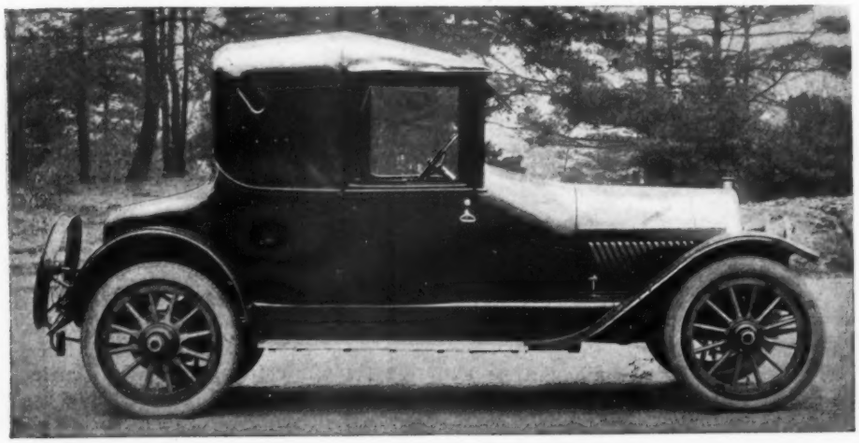
Time, however, will take care of things like this and we are within sight of the day when almost any stock electric generator and motor will fit almost any stock engine, a condition which is eminently desirable.

The application of either generator or motor to the side of the transmission case at one time appeared promising, as it frees the engine of a bulky part, but there is no indication whatever that this idea is likely to be considered except in a very few isolated cases. Probably on the engine is the best place for the generator, as it is most accessible there and well protected.

Steady, Sane Progress

Summing up, therefore, it appears that the electrical equipment record for 1916 is one of sane, steady progress without any prominent high spots. Changes have been mainly of the "settling down" kind; the elimination of peculiar or odd designs and a general bettering of manufacture. More real development work has been done with battery ignition where there have been a good many changes and a good many new things, and these will be dealt with in the next issue of THE AUTOMOBILE.

New Cabriolet on Oldsmobile Eight Chassis



New Oldsmobile four-passenger cabriolet mounted on the eight-cylinder chassis. It sells for $1,775

LONG low lines, flowing curves and German silver radiator with silver finish on lamps, hub caps and door handles are individual touches of the new cabriolet body mounted on the Oldsmobile eight chassis built by the Olds Motor Works, Lansing, Mich. The collapsible top has no exterior braces and can be handled from the inside by one man. Doors are substantial with large rattle-proof adjustable windows. The driver's seat is 15 in. in advance of the main seat which accommodates two passengers. A folding seat pivots under the cowl. The car sells for $1,775 f.o.b. Lansing. The compartment behind the driver's seat is of ample dimensions and can be used for parcels, gloves and other things of that sort.

Denmark — A Good Car Market

American Cars Are Rapidly Establishing Excellent Reputations for Economy and Durability—Field Should Be Further Developed —Industrial Conditions Similar to Those in the United States

DENMARK to-day presents one of the most rapidly growing markets for American-built automobiles and motor trucks, according to Knud A. Mammen, New York manager of Mammen & Drescher, dealers in American cars in Copenhagen. Mr. Mammen states that there are over 30,000 cars in use in Denmark at the present time, as compared with less than 2000 in 1912. The great bulk of these are passenger cars, there being comparatively few commercial vehicles, although there are some 200 taxicabs, which are not fitted with rubber tires, due to the high prices now prevailing for these in the Scandinavian countries.

Industrial conditions in Denmark at the present time are very similar to those in the United States, certain commodities having risen rapidly in price in consequence of the demands of the warring countries. Naturally a large number of people have profited by these developments, with the result that a new wealthy class has been created, the members of which have been dubbed by the general public "goulash barons." These people have been and still are large buyers of automobiles. In addition, farmers have profited by the high prices now paid for their products to such an extent that the majority of them have bought cars. Moreover, the Danish people have only recently awakened to the possibilities of the American car, and the normal demand has been growing at a rapid rate. An example of the interest displayed by the people of Copenhagen in United States of America cars was mentioned by Mr. Mammen, who said that two months ago he drove a new four-passenger American-built machine through the streets of the city one morning and that afternoon over twenty prospective car buyers came into the company's salesrooms with the cash in their pockets to pay for a machine on immediate delivery, but, of course, it was impossible to furnish what they wished at that time. Most of these people subsequently became owners of cars of that make in either the model they had admired or in some other style which appealed to them on making a further investigation. About three months ago similar conditions prevailed, every automobile dealer in Copenhagen having sold out his entire stock, and people were coming into the salesrooms every day with rolls of money to pay for cars which were not available on any terms.

Difficulty of securing shipping accommodations due to war conditions has been one of the greatest handicaps with which the exporters of American automobiles have had to contend. Mammen & Drescher, who handle Chandler, Pathfinder, Haynes, Elcar, and Singer cars, Chase and Duplex trucks, and Knox tractors, in addition to Fisk and other American tires, found that it cost them between $500 and $600 each for the larger cars when these were shipped crated, not including crating and carting and freight from the factory. By arranging with the factory to ship them the chassis knocked down and without bodies the firm effected a saving of 80 per cent. on the freight of each car. Upon the arrival of the chassis in Copenhagen they are taken to the company's shops and fitted with bodies of the European type and more in keeping with the desires of many of the purchasers than the standard American-built bodies appear to be. An interesting development of the present era of nouveux riches in that country is that the so-called "goulash barons" desire the bodies of their cars to be something out of the ordinary, and, as their tastes have not been very highly developed in this regard, the results are frequently grotesque. Sometimes they content themselves with a few flourishes of external ornamentation and perhaps a strikingly vivid coloring, and in other cases they order unusual and impractical body shapes. In the matter of interior arrangement of seats, color, and type of curtains, window operation, etc., they often demand the impossible, but are finally content to accept some approximation of their ideal, if the body builders cannot persuade them to accept a more

KNUD A. MAMMEN

EDITOR'S NOTE:—Our manufacturers of cars, trucks and accessories have frequently been informed that now is the time to develop and establish a world market for their products which will endure after the close of hostilities in Europe and many of them have taken advantage of the opportunities now offered for export trade. This article, based on data furnished by Knud A. Mammen, New York manager of the Copenhagen firm of Mammen & Drescher, and A. H. Anderson, chief engineer of the same concern, gives an inkling of the propitious conditions to be found in Denmark.

A. H. ANDERSON

MAP OF DENMARK, SHOWING SOME OF THE MAIN AUTOMOBILE ROADS

Touring is very good in Denmark, although the distances are of course small as compared with those in the United States. Roads are excellent, macadam and bituminous-surfaced highways preponderating. Those indicated by the black lines on the map are only a few of the more important thoroughfares connecting some of the leading cities of the country, but there are a great many more roads which have all the advantages offered by these and at the same time possess even greater scenic attractions. This is especially the case in the northern part of Jutland where some of the finest touring imaginable is to be found. Connections between the various islands of Denmark and also with the peninsula of Jutland are by ferries and the water trips lend a great deal of variety as well as giving some glimpses of very fine coast scenery. These conditions, coupled with the increasing prosperity of the country and the leaning evinced by the people of Denmark toward American cars, make that country a rich field for the American manufacturer

conventional but less conspicuous design for their machines.

An idea of the difficulties to be overcome in shipping cars from the United States to Denmark under present conditions may be gained by reviewing the necessary routine and red tape through which exporters are obliged to go before the cars are allowed to leave New York harbor. The Merchants' Guild in Copenhagen gives a declaration for orders which have to be viséed by the British Consul and by the Automobile and Cycle Merchants' Association, which is somewhat similar to the National Automobile Chamber of Commerce in this country. The matter then goes to the Scandinavian-American steamship line, which is the only one carrying American automobiles direct to Denmark. The steamship company cables to the agents in New York who handle its shipping from this country. These agents then notify the exporter what accommodations can be obtained for shipping the cars, giving ship, date, etc. It is then necessary for the exporter to write to the British Embassy at Washington, giving complete details of the order and describing all matter to be shipped thereunder, and also giving the names and addresses of consigner, consignee, etc. Upon receipt of an assurance for the goods and a permit from the British Embassy the cars can then be placed on the dock, after which shipment is a mere matter of routine with the steamship company.

Shipping Improved

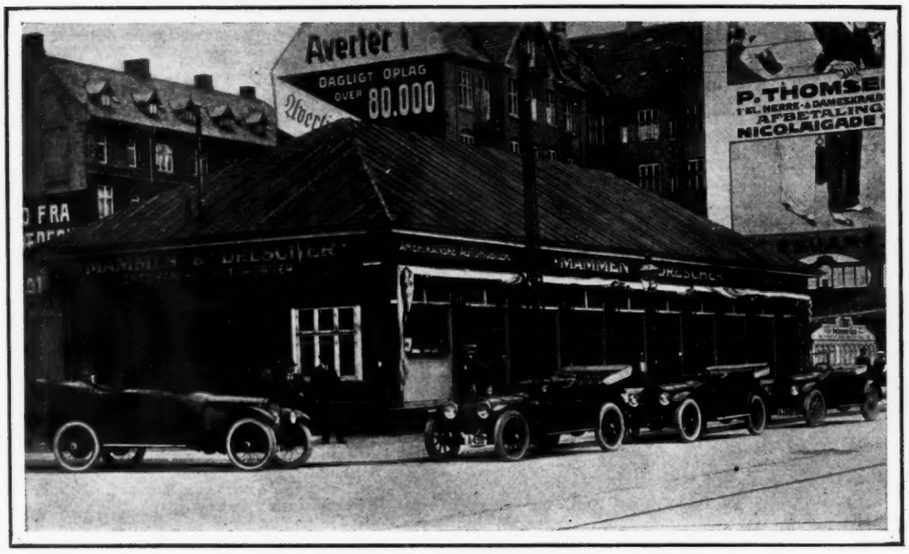
For about two years after the beginning of the European war automobiles could be shipped to Denmark only on freight boats, and frequently it was impossible to secure space on any of these for long periods at a time, due to the enormous quantities of war munitions which were being sent abroad for the use of the belligerent nations. Now the situation is greatly improved, not only because the exports of munitions have greatly decreased in volume, but also because passenger boats are now available as carriers of automobiles and motor trucks.

Tires Hard to Get

The restrictions enforced by Great Britain upon the shipment of rubber, including tires, to European countries naturally constitute another handicap on the exporter of cars from the United States to Denmark, because it is not only impossible to ship machines fitted with tires, but it is also exceedingly difficult to secure tires with which to equip them when they have arrived in Denmark. All tires must pass through London, and the strictest sort of supervision is exercised in England and also in Denmark to prevent the tires, or, in fact, rubber, in any form, from reaching Germany. For some time after the outbreak of hostilities unscrupulous persons took any means of securing tires, which they could sell in Germany at very high prices. When they were unable to obtain a sufficient quantity by buying in the open market or through private channels they stole them from cars and shipped them to Germany. To check these practices a system was developed by which no one could buy a new tire without

turning in the old one on the deal.

The importance of the first impression made by an American-built car on the market in Denmark is evident from the experience of Mammen & Drescher, as cited by Mr. Mammen, with the first machine the firm imported from this country. This car, a Chandler six, took part in a big reliability run held soon after its arrival in 1914, and made an enviable showing under particularly adverse conditions of weather, road, etc. As a result a demand immediately sprang up for these cars, and that particular machine has been sold three times, the owner each time turning it in for a new car. Similar experiences with the other American cars the company handles have confirmed them in their belief that it pays to demonstrate the good qualities of the machine for the benefit of the Danish public, which has never had very much experience with American automobiles until the last two or three years.



Showrooms of Mammen & Drescher in Copenhagen, Denmark. These are situated in the business district near the station through which the prosperous citizens make their daily trips between home and office. Note the American-built cars at the curb ready to give demonstrations, for which they are usually in great demand

There are too many automobile dealers in Copenhagen, Mr. Mammen says, who know practically nothing about the cars they sell. These dealers cannot give satisfactory service to the people who purchase their cars, and the natural result is that the machines they represent acquire a reputation as unsatisfactory in various ways. The same situation does not exist with regard to tires and accessories, as the dealers are more familiar with these and seem to handle the service matters in regard to them more satisfactorily than for the cars.

No Automobile Row

There is no automobile row in Copenhagen, which is the largest city, the capital, and the most extensive automobile market of any part of Denmark. The various salesrooms, garages, service stations, shops, etc., of the dealers in automobiles and accessories are spread over the business, and part of the residential, section of the city, and apparently only a few dealers have been thoughtful enough to secure locations advantageous from the viewpoint of passing traffic, etc. The salesroom of Mammen & Drescher, which is illustrated on this page, is fortunately situated, Mr. Mammen points out, being so placed in the business section of the city that practically all the prosperous citizens who are legitimate prospects as car buyers must pass it on their way to and from the station on their daily journeys between their offices and their homes in the suburbs or outlying residential districts.

American cars are now most popular of all in Denmark and bid fair to continue so after the close of the war, owing to their low price, durability, simplicity, and ease of upkeep. The possibilities of this country as a field for the United States of America car manufacturer are very great at the present time, and, if properly developed, the trade of our automobile industry with Denmark should grow to very large proportions in the future. When it is realized that the twenty islands and the peninsula of Jutland, which constitute Denmark proper, have a population of approximately 3,000,000, that the city of Copenhagen alone has over half a million people, and that there are about a dozen other cities with populations ranging from 10,000 to 70,000, it is readily seen that here is a field which our makers should not neglect. Then, too, the influence of good reputations established by American-built cars, trucks, and accessories in Denmark will have a very considerable effect in facilitating the development of our business relations with the insular possessions of that country.

American cars have had little competition to meet in Denmark during the last two or three years. Shortly after the outbreak of the war a number of persons, perceiving the increased demand for automobiles in the country, went to Germany and bought up all the French, English, Italian, and other cars they could secure and sold them at a big profit in Denmark. There is a car called the Scania-Vabis which has been sold in large numbers in Copenhagen and other Danish cities since the outbreak of the war. This car is made in Denmark from parts imported from Sweden. It is a rather heavy car and the output is necessarily small, so it does not offer very serious competition to dealers in American cars.

Money Easy to Get

Industrial conditions in Denmark at present are very similar to those in this country. The banks are in excellent condition and money is easy to get, so that dealers have no difficulty in securing financial backing. Thus cars can be sold on the time-payment plan if desired, though there is at present very little call for this arrangement in that country. As Denmark is primarily an agricultural center, the high prices for farm products which the war has caused are responsible for the widespread prosperity to be found among the Danish farmers, who, Mr. Mammen says, are buying cars fast, Fords predominating. No fat or butter is allowed to go out of the country except to England but the large fishing industry of Denmark has profited enormously from the war as it furnishes fish not only to England, but also to France and Germany. There are practically no cattle to be seen browsing in the fields, as an enormous number have been killed and the meat sent to Germany and those remaining are carefully guarded as beef sells for about $1 per pound. Other farm products have increased in price to a marked degree during the past 2 years; milk is 4 per cent higher than at the outbreak of the war and wool 100 per cent higher; butter costs 60 cents per pound, and all meats are far more expensive. Naturally the high price of wool and other cloth-making materials has had a great effect on the price of clothes, which are considerably more costly in every par-

ticular than was the case in that country 2 years ago.

One phase of the situation which must not be overlooked by the American manufacturer is that the farmers, attracted by the high prices paid, have sold practically all their horses for war purposes and these men are almost all logical prospects for the sale of American-built farm tractors and motor trucks.

All Plants Rushed

In the manufacturing field all the aeroplane, war munitions, and textile factories in Denmark are doing an enormous business and the stocks of these companies have soared to remarkable heights. Ammunition supplies and machine tools for factory equipment are produced for Russia in tremendous quantities besides a large output to other countries. The stock of one concern manufacturing these goods sold at $45 a share in 1914 and it is now quoted at over $530. The securities of shipping concerns have also had a rapid rise, the $100 par stock of one company being quoted at over $1,700.

Business morals have declined in Denmark in company with those in other European countries not involved in the great war. People realize that existing conditions are only temporary and many of them have made up their minds to make their fortunes quickly and without particular regard as to the means employed.

A Fine Touring Field

Denmark presents an unusually attractive field for touring and the roads are very smooth and well kept, being largely of macadam or bituminous surface. There is at present a law in effect which prohibits the use of all side roads by cars of over 2000 lb. This has no effect on the smaller cars and only restricts the larger ones to the main highways, which is a hardship only in so far as missing delectable bits of scenery in out-of-the-way places are concerned. It is very probable that this law will be repealed before long.

Roads Are Excellent

Of course all the islands as well as Jutland are covered with a network of good roads but some of the more important ones are indicated in the map on page 926. The country inland is rather flat but along the coasts there are magnificent stretches of rocks and cliffs, the latter being of white chalk in some instances as at Klint in the island of Möen. There are numerous beautiful boat trips between the islands, and in passing through the inland sections of beech woodlands and little lakes overhung by trees present a continuous variety to the neatly fenced fields and cozy cottages. In Northern Jutland there are some particularly lovely bits of scenery in the neighborhood of the chain of lakes running from Aalborg, a city of some 40,000 inhabitants, to the western coast.

Prospects in the Cities

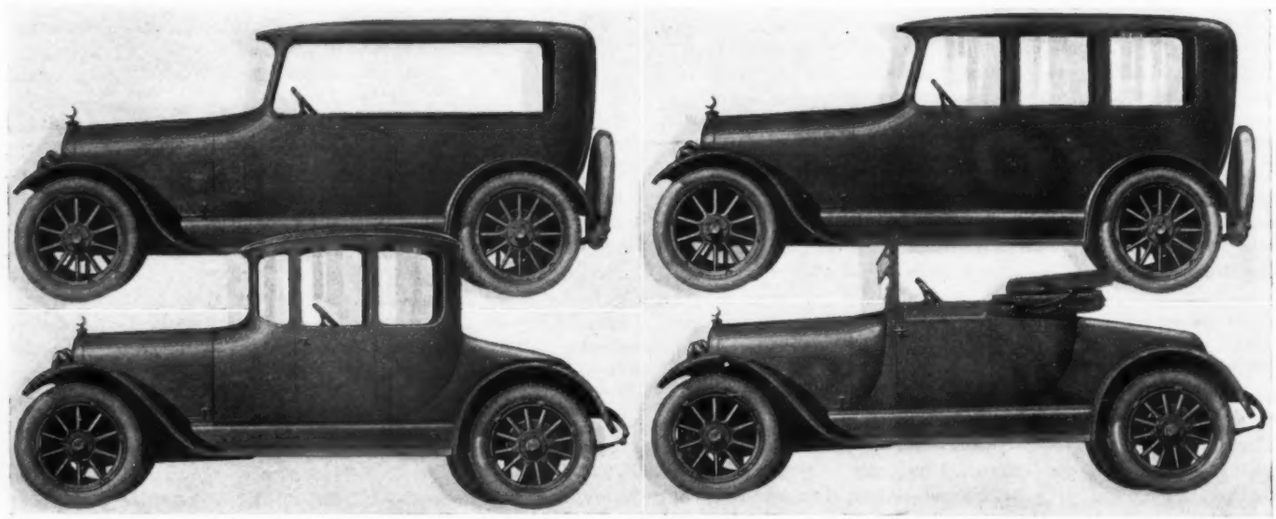
Some of the leading cities of Denmark which offer possibilities to the American car manufacturer are the following, as indicated by their approximate population:

Copenhagen	500,000	Randers	24,000
Aarhaus	70,000	Vejle	15,000
Odense	45,000	Elsinore	14,000
Aalborg	40,000	Fredericia	13,000
Horsens	25,000	Svendborg	12,000

To Assemble a Car

Mammen & Drescher are preparing to assemble a car in Denmark under their own name from standard units bought in the United States. This car was designed by A. H. Anderson, chief engineer of the firm, who is now in Denmark arranging for the handling of the first 500 chassis, parts for which will be shipped to the company's shops in Copenhagen as soon as the necessary preliminaries have been attended to.

Smooth Lines in Moon Closed Models



SUPPLEMENTING the report of the new closed models brought out by the Moon Motor Car Co., St. Louis, Mo., which appeared in a recent issue of THE AUTOMOBILE the above illustrations give an idea of the smooth lines and neat finish of these cars. That at the upper left is the seven-passenger sedan mounted on the 6-66 chassis and selling for $2,250; Below it is the four-passenger coupé on the same chassis and listing at $2,150; at the upper right is a view of the sedan as a closed car, the windows and pillars being folded out of sight in the other view. Below at the right is the cabriolet design which, like the coupé, seats four, and which sells for $1,850 on the 6-43 chassis and for $2,150 on the 6-66. The interior appointments of these bodies are in keeping with their exteriors.

Many Factors in Brake Design

Tire Adhesion, Road and Wind Resistance and the Personal Equation—Brakes on Two Wheels Are Enough

By John Younger

EDITOR'S NOTE:—Paper read by John Younger, chief engineer of the truck department of Pierce-Arrow Motor Car Corp., before the Pennsylvania section of the Society of Automobile Engineers Nov. 22.

DURING the past 2 or 3 years emphasis has been laid on the accelerative ability of cars. Designers have vied with each other in getting the last fractional inch per second, per second into their performance curves. Advertising managers have not been slow in accelerating the peaks a little further and finding that the public liked it.

Get away, Pick up, Dash, Verve—I have myself called it Elan—are all familiar terms for the engineer's word acceleration. There is as yet no term of endearment for retardation. Its significance has not gripped the people's imagination, and yet of the two it is of more vital importance. The automobile death rate increases in inverse proportion to the efficiency of the retardation curve.

In fast rail traffic, with many stops, the possible retardation curve is first studied. Running a continuous stream of cars through New York subways, with an infinitesimal headway at rush hours, has caused their engineers to know almost to a fraction of a foot just where the brakes must be applied to stop at the required point at a station.

Similarly in street car work: The profit that can be derived from a set of rails in a busy district is as much a question of retardation as of acceleration. The automobile moving rapidly in and out of city traffic places, perforce, great dependence on its brakes, and actually good braking contributes greatly to the feeling of liveliness. A car with good acceleration, but sluggish retardation, does not feel as lively as one with both good.

Retardation can be studied under two heads:

A—Retardation relative to the road.

B—Retardation relative to the forces acting on the car.

The primary object of the former is to slow down and actually stop the car.

The object of the second is to maintain the vehicle at a steady, safe speed, notwithstanding the forces, such as effect of gravity on a hill, that are tending toward acceleration. Both actions have special characteristics which will be taken up separately.

Co-efficient of adhesion of average rubber tire, with good macadam, asphalt, concrete or brick road, 0.5.

Maximum retardation car should be capable of 10 ft. per sec. per sec.

Usual retardation for slow down or stop, 6 ft. per sec. per sec.

With pedal push a man can exert in properly designed seat, 300 lb.

With lever pull a man can exert on brake lever upward of 100 lb.

Efficiency of average brake linkage allowing for usual weak system of lubrication, about 75 per cent.

Radiation that should be provided for long hills, about 200 B.t.u. per minute per ton weight of car.

Tire Adhesion Figures

Obviously, the first consideration is the boundary between the car and the road—the co-efficient of adhesion or friction of the tire. This varies greatly; the shape of the tire, the nature of its tread, whether it be solid or pneumatic; the compound of rubber used, play their share in varying this; and the very fact that the road surface ranges from cement or vitrified brick to greasy mud makes us realize how impossible it is to give figures which mean anything. Curiously, pneumatic tires have a co-efficient differing from that of solid tires, the writer having found it sometimes higher, sometimes less.

George Watson, before the English I. A. E., January, 1916, gives 0.4 as the maximum adhesion of solid rubber tires on good macadam. Other authorities state that 0.6 is the figure for pneumatic tires. The writer has found an adhesion of 0.6 for solid rubber tires on cement and vitrified brick roads, and only 0.5 under similar conditions for pneumatics. The measurement of tire adhesion is, however, inextricably mixed up with that of road resistance, the number of factors entering in being exceedingly large. A convenient and accurate standard to assume is 0.5, and this is concurred in by several authorities.

I have been careful to use the term adhesion in the foregoing as specially applicable to the case where the tire does not slip relatively to the road. When the tire slips the proper term is friction. There being no relative motion between the surface of the tire and the road (the road moving back at the same speed as the tangential velocity of the car), it is obvious that the case is analogous to the body at rest on an inclined plane. The co-efficient of stiction or adhesion is greater than that of friction. Incidentally, this partly explains why a car stops more rapidly when the wheels are kept moving than when they are locked.

Road Resistance

Nature has been very good on the whole. Smooth asphalt, concrete, brick, good macadam, which offer little resistance to the passage of the car, have fortunately a good co-efficient of adhesion when dry, thus offering fair compensation. As is well known, road resistance ranges from 5 lb. to over 300 pounds per ton. It is a factor which must be considered in the study of retardation.

Wind Resistance

This may very conveniently be taken as $0.002\ Av^2$ in pounds, where A is projected frontal area in square feet, usually about twenty-five square feet. Again, this is a variable depending on wind velocity and direction. Strictly speaking, it should always be considered, but its effect is small and may

be left out in comparison with the other important items.

Possible Retardation

Given brakes on all wheels, and neglecting road resistances, we would have a retarding force of 0.5 W.

Whence from the inertia formula $F = \frac{W a}{g}$

we have the retardation $= 0.5\ g$

or 16.1 feet per sec. per sec.

The average car has, however, the brakes on the rear wheels only. Its weight is distributed equally on front and rear wheels as a rule.

The retarding force is then $\frac{0.5\ W}{2}$ and thence

the retardation is $0.25\ g$

or about 8 feet per sec. per sec.

With this latter we have that

	Stopping time.	Stopping distance.
A car going 60 miles per hour....	11 Secs.	484 Ft.
A car going 30 miles per hour....	5½ Secs.	121 Ft.
A car going 15 miles per hour....	2¾ Secs.	30¼ Ft.
A car going 5 miles per hour....	.625 Secs.	4½ Ft.

The presence of road resistance, wind resistances, and chassis losses will bring this figure of 8 feet per sec. per sec. up very closely to 10 feet per sec. per sec. deceleration, so that a car traveling at 30 miles per hour will stop in 4.4 seconds and cover about 97 feet.

Comfort in Brakes

Everyone has experienced the peculiar feeling of being shot forward in the seat when brakes are suddenly and strongly applied in railway train or street car. The eyes have not prepared the body to brace up against the action, whereas in an automobile the eyes are usually on the alert and the body is well prepared for violent retardation.

Yet, in railroad service the best stop is that recorded in March, 1914, when a Pennsylvania train experimenting with a new type Westinghouse brake stopped in 1000 feet from a speed of 60 miles per hour. This took 22¾ seconds and was a retardation of only 3.87 feet per sec. per sec.

Experience has shown that an acceleration or deceleration of 6 feet per sec. per sec. is about all that can be borne in comfort by passengers. There are naturally many who cannot even bear this, and many who can bear much more. It is interesting to note en passant the terrific velocities that man can stand, but the very small changes in it.

Extreme change, such as stoppage against a stone wall, will catapult passengers out of their seats with great violence. Six feet per sec. per sec. is on the verge of discomfort; it is, I think, reasonable to believe that 10 feet per sec. per sec. is the maximum that should be cared for. This, by the way, is equivalent to an applied horizontal pressure on the passenger of about one-third his weight. So with the chassis. The inertia effects on the body fastenings, engine and transmission fastenings are usually based on the acceleration at low speed, and this is very rarely more than 10 feet per sec. per sec., the equivalent of a 30 per cent. grade.

Four-Wheel Brakes

It is thus seen that for the average vehicle there is little to gain in putting brakes on more than the two rear wheels. It is true that they could be so adjusted that the braking friction were only half what it might be, but this is exceedingly difficult to determine and keep in adjustment, and there is real danger in excessive retardation being produced under the normal circumstances of driving over dry roads. Railroad conditions are not analogous, as a co-efficient of adhesion of 0.2 is about all that can be reckoned on against our 0.5 to 0.6 on rubber-shod automobiles.

Two-wheel brakes, provided they function properly and are used intelligently, will give all the retardation that it is safe to use. This is not, of course, the only reason why all-wheel brakes have not been adopted generally, but it is one of them.

Truck Brake Considerations

The foregoing remarks have dealt mostly with a car whose weight is distributed equally fore and aft. The passenger load is usually a small percentage of the gross weight, and there is an obvious limit to the human capacity of the space. The truck is often twice as heavy when loaded, and overloading to the extent of double the rated amount may occasionally be met with, though this evil is, I think, getting less.

There are still a few trucks whose load is more or less balanced between front and rear wheels, but they are in the minority. The load is most usually carried 75 per cent. and upward on the rear axle, and it is this the designer must pay attention to. The weight of a truck is in no proportion to its load. A two-ton truck with body may weigh 6000 pounds, or 1.5 times its load, whereas a five-ton truck with body may weigh 10,000 pounds, or equal to its load.

Each truck, therefore, must be considered individually, and the final braking effort on the circumference of the rear wheels be made equal to at least 0.5 times the loaded weight at the rear wheels. Assuming the speed of the truck at fifteen miles per hour, this will stop the truck in about thirty feet, without causing the load to pile up behind the driver's seat. This should be short enough for any board of councilmen, and should preclude the necessity for providing safety guards or fenders.

The Personal Equation

The human element in producing retardation is very great. Brakes must be skillfully applied, so that under varying road conditions the pressure is just enough to not lock the wheels, otherwise a dangerous skid might result. Women are driving cars in increasing numbers. They are unable to exert the same pressure on pedal or lever that a man can. Designers must awaken to this problem. If a light pressure is given, brakes must be adjusted more often, unless some mechanical or electrical means be supplied for assisting the human strength. As stated, this must be very delicately arranged to give perfect gradation of pressure, but the problem should not be impossible of solution.

Continuous Braking

The question of absorption of energy has been ignored in the foregoing, inasmuch as the time interval is short, and the material surrounding the brakes well capable of taking up the heat developed. On a long hill, where brakes are applied continuously, the problems that arise are different. Here there is no question of inertia effects, or of skidding, or of stopping space available; the great question is one of absorption of energy and hence radiation of heat.

At the top of a hill a car possesses both kinetic and potential energy. If at the bottom the car's speed is unchanged, then the brakes, plus the road resistance, have absorbed the potential energy. The weight of the car plays an enormous part in this, the absorption of energy being in direct proportion to it. Whilst the truck lacks the speed of the touring car, it makes up for it by weight in hill descents, and the retardation problem is the more difficult.

A Specific Hill

There are many hills 10 per cent. grade and one-half mile long. A five-ton truck, gross weight 20,000 pounds, has a gravitational component down hill approximately 2000 pounds. Assuming a road resistance of fifty pounds per 2000 pounds, or 500 pounds gross, we have a net force tending to accelerate the truck down hill of 1500 pounds.

If a safe speed of ten miles per hour is maintained the

time of descent is three min. The energy absorbed by the brakes is 1500 x 2640 ft. lb.

Or at rate of 1,320,000 ft. lb. per min.

Or 40 H. P.

Or 1700 B.t.u.'s per minute.

Take now the fact that approximately fifty pounds of metal with a specific heat of 0.12 absorb this, we have enough heat generated in three minutes (neglecting radiation) to raise the temperature of the mass from 60 deg. Fahr. to 900 deg. Fahr.

In a practical corroboration it was found there was one square foot of radiating surface from which the balancing temperature was calculated to be about 760 deg. Fahr.; the surface at the foot of the hill was certainly nearly that, being a black heat.

There are hills much worse than this in length and grade, the only salvation being the use of the engine, alternating with hand and foot brake. For the great majority of touring automobile work the normal brake is satisfactory, but for hilly and mountainous districts there is still much to be done. European designers have been well aware of this, some of the Italian designers whose testing grounds were the Swiss Alps have even gone the length of water cooling their brakes, both by drip and by waterjacket.

Auxiliary Brakes.

Only one truck, and that one of Swiss design, has attempted to solve this problem, and that by means of a device which shifts the camshaft longitudinally, converting the engine into what is really a two-cycle air compressor, the carburetor being shut off and fresh air admitted through a manifold port.

From time to time brakes working on a hydraulic principle have been devised, but always there has been the problem of cooling the liquid and insuring the tightness of pipes and joints.

It is the writer's impression that as the country roads get opened up more, and trucks are used in outlying districts, a demand will arise for a third brake for hilly districts. This will enable the vehicle to coast down a long incline at a predetermined safe speed, with no wear and tear on the engine or undue heating of the brakes.

Discussion of the Paper

At the meeting the chair was taken by B. B. Bachmann, and although the attendance was not very large it was obvious that every member present was very keenly interested in the paper. The discussion was opened by A. Ludlow Clayden, engineering editor of THE AUTOMOBILE, who took up the subject of brake materials, asking whether Mr. Younger had any data with respect to their relative qualities. He pointed out that the usual kind of brake lining is a fairly good heat insulator which means that most of the heat generated in the brake has to be dissipated by the drum since the brake band or shoe is to some extent insulated by the lining. He said that metal brake surfaces were still the most extensively used in Europe and that all kinds of materials had been tried. Cast iron is the most usual but phosphor bronze has been used, and one brake for which great claims were made had the shoes faced with alternate sections of different materials. Trials were made with half the brake surface cast iron in sections about 2 in. by 2 in. and the other half phosphor bronze, white metal, aluminum, and, finally, compressed asbestos fabric.

The last time the speaker had any information from Europe regarding this brake the cast iron and fabric segments were proving very satisfactory, it being stated that the bonding material in the fabric seemed to spread a little over the iron, preventing rust. Also, it was said that the brake operated without the scrape usually associated with a plain iron brake.

Another point which is not often appreciated is the great theoretical advantage of diagonal braking. This consists of having brakes on all four wheels, so connected that one control operates the right front wheel and the left rear wheel simultaneously, the other control operating the other pair. The object of this layout is that as soon as either the front or rear wheel ceases to revolve it loses its power to direct the line of motion of the car. If both back wheels or both front wheels are locked the car is unsteerable, but with diagonal linkage it is possible to lock one pair and still have one wheel on each axle rolling freely and therefore available for steering.

The disadvantages are purely mechanical, the link system becomes very complicated and the brake is costly.

L. Goldmerstein, editorial staff, *A. S. M. E. Journal*, supported Mr. Younger's contention that it would be essential to have two sorts of brakes, one intended for rapid stopping and the other for the descent of long grades. He described a possible form of brake with which he has been experimenting wherein power is absorbed by a reciprocating piston which draws oil into a cylinder and then expels it through a small valve, the lift of which is controllable. This raises the temperature of the oil and the heat can be dissipated by any convenient means. One way he suggested was to extract the heat by making the oil do work such as the driving of a fan.

Regarding the conductivity of linings, this undoubtedly was very poor but the most remarkable fact was that the conductivity decreased as the intensity increased. The soft linings were much better conductors than the hard ones. This doubtless was due to the action of the air which would be contained in considerable quantities between the meshes of the softer fabrics.

Truck Brake Requirements

E. R. Whitney, chief engineer, Commercial Truck Co. of America, said that in designing brakes for trucks it was essential to make them so that a considerable effort was required to apply them. At one time he said his company had fitted a brake of exceptional power and discovered very quickly that truck drivers were using it so viciously that severe damage was being done to the mechanism generally

In his reply Mr. Younger said that he agreed entirely with the last speaker and that he had discovered a brewery truck driver, whose services he had enlisted for the purpose of experiment, was able to exert a pedal pressure of 400 lb. Regarding brake materials, it was undoubtedly a fact that the usual linings were good insulators and this he thought accounted for the rapid wear on brake drums with cars used in mountainous districts. He pointed out that with an internal and an external brake on the same drum all the radiation from the drum is limited to its inner edge and said that he had known a case where the drum had got so hot that it had parted all around the edge, the ring separating from the disk. Cases where the spokes of a wood wheel had been blistered were also not uncommon. Up to the present he had not been able to find any material better than cast iron for facing the shoe of the propeller shaft brake on a truck.

Drum Surface a Factor

One important thing which seldom received any consideration, was the nature of the surface of the brake drum. Evenness of wear he said was affected profoundly by the nature of the surface when the drum was new. If the brake drum is merely turned it is left covered with minute but very sharp points and these exert an unnecessary cutting action on the shoes or band. If the surface of the drum is ground to a fine polish the surfaces will last longer.

Concerning Mr. Goldmerstein's remarks about the conductivity of fabric, this explained something which he had noticed and which had puzzled him. This was that the softer linings appeared to suffer less from prolonged heating, as in the descent of a mountain, than did the heavily compressed fabric, although the latter was much more durable in ordinary stopping service where long grades were not encountered. After prolonged heating, the compressed fabric appeared liable to disintegrate in some way.

Alcohol—The Fuel of the Future

Enormous Demand for Gasoline Makes Alcohol and Benzine Potential Developments for Automobile Engine Fuel—Utilization of Wood Waste Offers Vast Supply

By Bernard N. Glick, M. Sc.

EDITOR'S NOTE:—As previously pointed out by Mr. Glick in his article on the manufacture of gasoline from casing-head gas, the increasing demand for gasoline for automobile fuel renders the development of other fuels imperative. In this article the author reveals many interesting possibilities in the production of alcohol and benzine suitable for fuel purposes, dwelling especially on the enormous supply of wood waste as a source of alcohol.

WITH approximately 3,000,000 motor vehicles doing duty in the United States, from 1,000,000,000 to 1,200,000,000 gal. of gasoline have to be provided annually to keep them running. There are unmistakable signs that the production of this enormous volume of gasoline will become increasingly difficult and as a consequence there is in the minds of many automobile engine students the vague thought that gasoline, while the fuel of to-day, may have to give way to some other product to-morrow. In this connection it is comforting to know that there is a substance already well known, which can take the place of gasoline and run these automobiles just as efficiently, and perhaps more so.

The substance that thus stands out predominantly as the fuel of the future is alcohol. This product has long since passed the stage where its suitability was questionable, the only thing retarding its adoption being its high price, due to the raw materials now used and the limited use to which it is put at present. With a growing demand, such as will arise when the price of gasoline becomes abnormally high, we anticipate a search for cheaper methods of production and for raw materials which will give it in sufficient amounts to meet the enormous demand that will exist for a suitable fuel for internal combustion engines.

The question of the suitability of alcohol as a source of power in internal combustion engines has been sufficiently established by long series of tests conducted by various groups of experimenters. The United States Bureau of Mines has done magnificent work in this direction and many of the following figures comparing gasoline and denatured alcohol are taken from the results of their painstaking efforts to help solve the fuel problem of the future. Although the calorific power of alcohol is little more than one-half that of gasoline —about 11,160 and 20,900 B.t.u. per lb. respectively—its greater efficiency—alcohol 28 per cent; gasoline 16 per cent—compensates for this. This higher efficiency of alcohol is due to various causes, chief among which are the following:

Less Air Required

1—The volume of air required for complete combustion of alcohol is only about one-third that required by gasoline, and thus much less energy goes away in the exhaust. Moreover, this smaller dilution with air enables a more perfect mixture to be formed with consequent more perfect combustion.

2—The alcohol-air mixture can be safely subjected to pressures of 200 lb. per square inch without spontaneous ignition, whereas the safety limit for gasoline is 80.

3—All mixtures of alcohol and air containing from 4 to 13.6 per cent of alcohol are explosive, whereas the explosive range for gasoline is from 2 to 5 per cent, necessitating much more careful carbureter adjustment.

4—The combustion products of alcohol are smokeless, almost odorless, and do not clog up the cylinders and valves.

Gasoline for Starting

The only serious difficulty encountered would be the starting of the engine in cold weather and this could be provided for by carrying a small auxiliary gasoline tank to be used in starting.

Raw Materials Abundant

The possible raw materials for alcohol production are unlimited, for anything containing starch, cellulose or sugar can be utilized. In the case of starch we are limited at present to established crops, and the cost of the raw material from such substances as potatoes, maize and rice includes raising the crop, harvesting it, transportation to the distillery and the final conversion there to alcohol. As a consequence the cost of the raw material is too great, varying as it does from 12 to 25 cents per gallon of finished alcohol.

With cellulose and sugar we are able to make use of by-products of other industries where all the above charges are rightly charged to the main industry, and so with the cellulose waste of the lumber industry, finished alcohol can be produced under present conditions at from 13 to 19 cents per gallon, and from the sacchariferous waste of the sugar industry at approximately 15 cents a gallon.

Around the forests, the fields and sawmills of this country there are millions of tons of waste material now allowed to rot or burn, to get rid of what is in many cases considered a nuisance. Various forms of vegetation, which with the aid of the chemist could be rendered valuable sources of fuel supply, are allowed to die, having served no useful purpose during their existence.

Wastes from paper mills, comprising millions of gallons of liquor containing sufficient fermentable matter to be worthy of exploitation, are allowed to pour into the rivers, impairing their beauty and constituting a menace to the fish in them.

Crops of all sorts, corn, maize, oats, barley, potatoes, rice and many others could be increased and exploited to produce alcohol as a fuel, while the sugar industry could furnish thousands of tons of refuse material eminently suitable for its further production.

Lumber Waste a Vast Supply

Of all the above possible sources, the most interesting, owing to the low cost of raw material, is the waste from the lumber industry, particularly that in the form of sawdust or small chips. This material in the vicinity of sawmills or woodworking plants is often an item of loss owing to its

production in excess of their own power requirements, its value never rising above 50 cents per ton, even when used as a source of power. The disposal of this superfluous waste from figures gathered by the Forest Products Laboratory at Madison, Wis., costs from 30 to 66 cents per cord of 1800 lb., the total annual loss from this cause amounting to about $6,000,000 annually, in addition to the value of the wood so burned. This represents an annual wastage of approximately 15,000,000 cords of wood and constitutes only about 50 to 60 per cent of the total waste material produced in this form. Thus we see that there is produced annually in the United States waste material amounting in volume to about 30,000,000 cords, or around 27,000,000 tons, which is now burned as the easiest method of getting rid of it.

Wood Alcohol Useless as Fuel

From experiments which have been carefully conducted by various experimenters, a ton of dry sawdust has been found to yield with proper treatment around 20 to 25 gal. of 95 per cent alcohol (ethyl or grain alcohol, not wood alcohol, for this latter is useless for fuel purposes owing to the formation of products of combustion which would wreck the cylinders) and we could have therefore an estimated production from this source alone of around 500,000,000 gal. annually. If we add to this the amount of wood wasted in the form of stumps and branches sufficiently thick to be barked, which on a conservative basis is equal in amount to the sawdust and chips produced, we would get from this "waste" wood a volume of alcohol almost sufficient to supply with fuel even the stupendous number of automobiles at present in use.

Process Now Used

The process now used for the production of ethyl alcohol from wood consists first of all in hydrolyzing the hogged and shredded waste with dilute sulphuric acid at a steam pressure of about 60 lbs. for a short time. This is done in rotary digestors, made of steel boiler plate with an acid proof lining to insure a thorough mixing of the wood and acid. In this operation a portion of the wood is converted into a mixture of sugars, some of which are fermentable. The digested mass is then transferred to a diffusion battery where the sugar and other soluble material is extracted. The acid extract is neutralized with lime or limestone. and a heavy sludge of calcium sulphate is formed, leaving a neutral sacchariferous liquor on standing. The clear solution is drained off and fermented with yeast, and the alcohol produced separated by fractional distillation and rectified in the ordinary way.

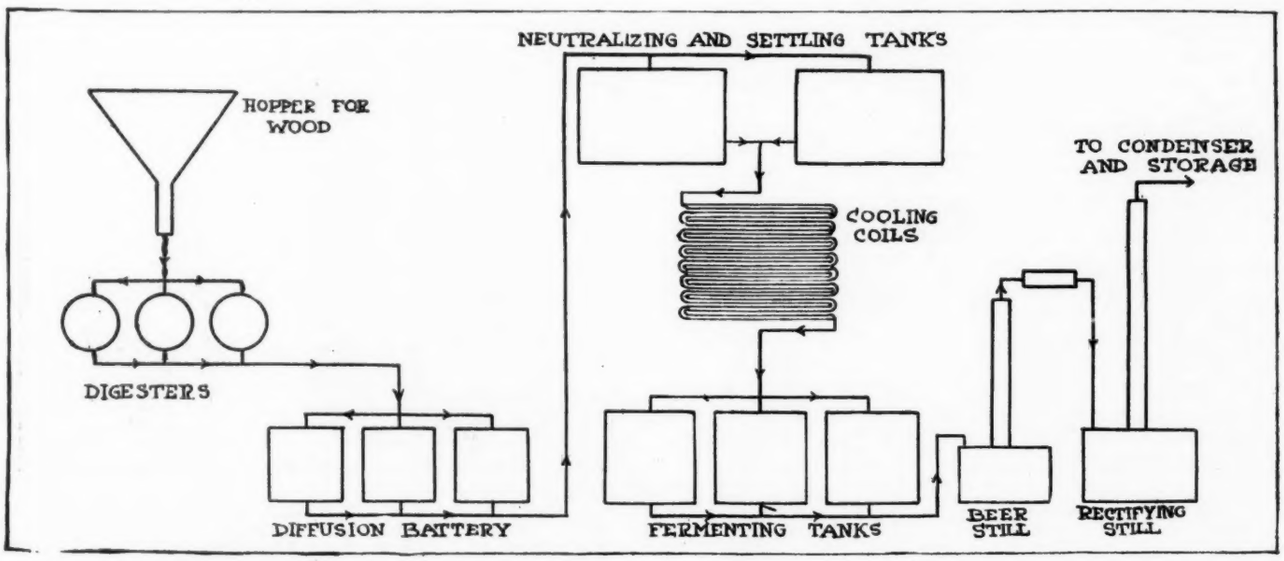
History of Early Work

The first known attempts to produce sugar from vegetable matter were those of Braconnot in 1819, and since that time many have worked, experimental plants have been built and operated, all to meet with failure owing to lack of scientific and engineering knowledge. In 1898 Simonsen published the results of his investigations using very dilute sulphuric acid as the hydrolyzing agent and claimed to have got an amount of alcohol equivalent to 6 per cent of the weight of dry wood used. A small plant was built in Christiania to try out his process but failed owing to the extreme dilution of the acid used, thus making the handling of the large volume of liquor produced uneconomical.

Some time later Classen developed a process in which sulphur dioxide was used as the hydrolyzing agent. This process is interesting for it marked the beginning of the development of this industry in America, for the American rights of the Classen patent were acquired by a Chicago concern in 1903, which, after experimenting, erected a plant at Hattiesburg, Miss., costing about $250,000 to operate on longleaf pine sawdust.

Process Successful if Correctly Used

This plant was a failure for a number of mechanical and technical reasons. Ewen & Tomlinson, who were associated with the Classen enterprise, then struck out on their own and after experimenting with sulphur dioxide in different forms as a hydrolyzing agent, finally abandoned it and went back to dilute sulphuric acid. They erected a plant at Georgetown, S. C., which was later acquired by the DuPont Powder Co. who operated it intermittently until the sawmill in connection with the plant was burned in 1913. While a new mill was being erected they devoted a considerable amount of time and money to research on the problems involved and the result is evidenced by the fact that they are now producing over 2,000,000 gal. per annum of absolute alcohol at a nice profit. Other plants have been built in the west by men without knowledge of the requirements of the process and without adequate technical supervision, and have met their inevitable fate. In fact, as long as the development of this process, which requires the highest type of engineering and chemical skill, is left in the hands of men



Diagrammatic layout of a plant for the manufacture of alcohol suitable for automobile fuel from wood waste

of the stock promoting type, the various attempts made will be failures.

Cost of Production

The Forest Products Department, Madison, Wis., has got up as the result of its experiments, an estimate of the cost of production which is given below. The estimate assumes a yield of only 20 gal. of alcohol per ton dry waste, costing 40 cents per cord of 1800 lb. and a location where the supply of waste is uniform and constant for a period of 20 years, with good water facilities and a fairly close supply of sulphuric acid and lime. In such a place, a plant properly designed and constructed, of 2500 to 3000 gal. daily capacity, will yield alcohol of 95 per cent purity at a cost of 13.7 to 19.5 cents per gallon. These figures certainly seem to justify their serious consideration by lumbermen and capitalists, for there certainly seems to be all the necessary factors for successful exploitation here. Some impetus is required though, to get things started and, as stated above, that impetus will surely come when gasoline sticks too long at an inordinately high figure.

The tests and results referred to were for engines designed for the use of gasoline as a fuel, the use of alcohol not having been considered. Were this done, however, and engines capable of taking advantage of the various factors favoring alcohol used, particularly taking into account the greater efficiencies possible, using an engine capable of working at compressions up to 200 lb., it is very likely that after as much time and study had been devoted to perfecting such engines as has been hitherto devoted to those using gasoline, a comparison even more favorable to alcohol might be the result.

Numerous other tests have been performed using mixtures of alcohol with other substances, the most important being benzine. It has been found that such mixtures are superior to either alcohol or benzine used separately, the most effective mixture being that formed by mixing one part of alcohol with one part of benzine. As evidence of this two series of tests may be quoted.

Germans Use Alcohol

In Germany since the war began a considerable shortage of gasoline has developed and substitutes had to be devised. Alcohol is fairly plentiful there, being made from potatoes, while benzine is recovered in a very thorough manner from their by-product coke ovens. It was natural then that they should turn to these for a gasoline substitute. From a series of tests with a Mercedes car of the 1914 touring model having an ordinary carbureter, the following results were obtained.

Fuel	Speed per Hr. (Miles)	Distance Covered on 1 Pint Fuel (Miles)
Gasoline	44	3.60
Benzine	42	3.79
1 pt. benzine 1 pt. alcohol	42	4.66
1 pt. benzine 2 pt. alcohol	41	4.47
1 pt. benzine 3 pt. alcohol	39	4.34
1 pt. benzine 4 pt. alcohol	38	4.10
1 pt. benzine 5 pt. alcohol	36	3.72

Difficulty was encountered in starting the car on the above mixtures and this was overcome by carrying a small auxiliary tank containing gasoline for use in starting. The mixture of alcohol and benzine in equal proportion was found to be decidedly superior to gasoline, and calculated at before-the-war prices, was more economical, too.

W. T. Ormandy ran a series of similar tests on a four-cylinder Maudesty engine (90 by 130 mm. with compression space about 25 per cent of total cylinder volume) and expressed his results as follows:

Fuel Used	Power Gasoline = 100	Volume of Fuel Used Gasoline = 100
Benzine	98.25	84.5
1 benzine 1 methyl sp	99.0	96.3
1 benzine 2 methyl sp	92.0	108.9
1 benzine 3 methyl sp	91.5	124.5

Sp. gr. gasoline 0.710. Sp. gr. meth. sp. 0.815. Benzine used 90 per cent. Sp gr. 0.885. Engine run at 1000 and 2000 r.p.m.

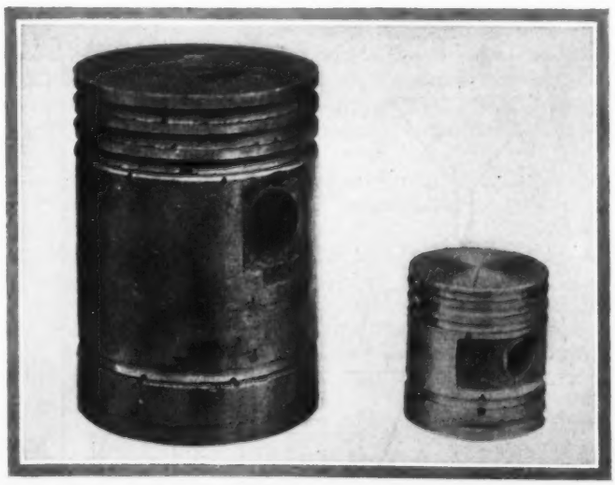
These tests are typical of a number of others and show that mixtures of alcohol and benzine make eminently suitable fuels for even engines built to use gasoline, and that were it possible to produce sufficient benzine the most favorable mixture would be that containing equal amounts of the two.

Possibilities of Benzine

Benzine has long been known as a possible automobile fuel and it is ready to step into the breach as far as possible. The chief factors militating against its use alone are first of all, the unfortunate fact that it solidifies at 5.4 deg. Cent., or 41.7 deg. Fahr. and would thus be useless in cold weather and, secondly, that the maximum possible production at present is about 100,000,000 gal. annually or less than 10 per cent of the amount of gasoline now used. This is not because more could not be produced, for the raw material, coal, is here in abundance, but is due to the fact that only a small percentage of the coal burned annually is burnt in such a way as to allow of the recovery of the benzine from it. If the coal consuming public could be educated to the use of coke for heat and power production, thus allowing of the burning of coal at central stations, as is now being suggested in England, with the recovery of all the by-products, coal gas, benzine, toluene, carbolic acid, naphthaline, creosote anthracene, etc., that now go up in smoke, there could be produced sufficient gas to materially reduce its present price to consumers, benzine enough to use in conjunction with alcohol to replace gasoline and still enough left over, along with the other products, to put the budding American dye industry on a firm independent footing.

Before the war benzine was selling in the neighborhood of 17 cents per gal. and would therefore reduce if anything the price of alcohol with which it were blended. The raw materials for both these, wood and coal, exist here in abundance, both could be obtained as by-products of some other industry, and both at present are produced in insignificant amounts, owing to the lack of initiation and enterprise that are necessary for their production in worth while amounts. If properly developed to their fullest possible extent they would effectively lay the ghost of the failing gasoline supply.

Piston Progress Illustrated



The advance in piston design made in the past five years is brought out strikingly in the two pistons illustrated above. That at the left was used in the six-cylinder Oldsmobile Limited for 1911 and 1912. It was of cast iron and weighed 6 lb., 14 oz. That at the right is the 9 oz. aluminum piston used in the new eight-cylinder Oldsmobile.

Constant Pressure Cycle Truly Efficient

Criticisms of Suggestions Founded Upon Unsound Basis—A Reply to J. L. Napier

By Arthur B. Browne and Herbert Chase

THE criticism written by James Langmuir Napier entitled "The Truth about the Constant Pressure Cycle," which appeared in the August, 1916, issue of *The Automobile Engineer*, and was reprinted in THE AUTOMOBILE, attempts to promulgate so many half truths and contains such wholly unwarranted attacks upon statements made in papers read before the (American) Society of Automobile Engineers and the (British) Institution of Mechanical Engineers, that we cannot permit it to go unchallenged.

Holding up to ridicule what he terms a "quasi-scientific" statement made by Mr. R. M. Neilson,* a former associate of Mr. Dugald Clerk and a member of the Institution of Mechanical Engineers, and charging "neglect of elementary principles" in our paper entitled "Possibilities of the Constant Pressure Cycle," Mr. Napier proceeds to ignore every detail and refinement of the proposed constant pressure cycle save those which, by wholly impracticable comparisons, could be made to subserve his own arguments. He then closes with a diatribe against a "burner" which by actual operation, under conditions more exacting than those of its application to a reciprocating engine, is daily proving the superficiality of his judgment. In order that the truth may prevail we offer the folowing:

*The reference cited was taken from a paper entitled "A Scientific Investigation Into the Possibilities of the Gas Turbines" which was presented in October, 1904, before the Institution of Mechanical Engineers, of which Mr. Neilson was then an associate member. Among those who discussed Mr. Neilson's paper were Mr. Dugald Clerk, Prof. F. W. Burstall, Mr. James Atkinson, Col. R. E. B. Crompton, C.B. These gentlemen would hardly have allowed Mr. Neilson's figures on the constant pressure cycle to go unchallenged if they were not well founded in fact.

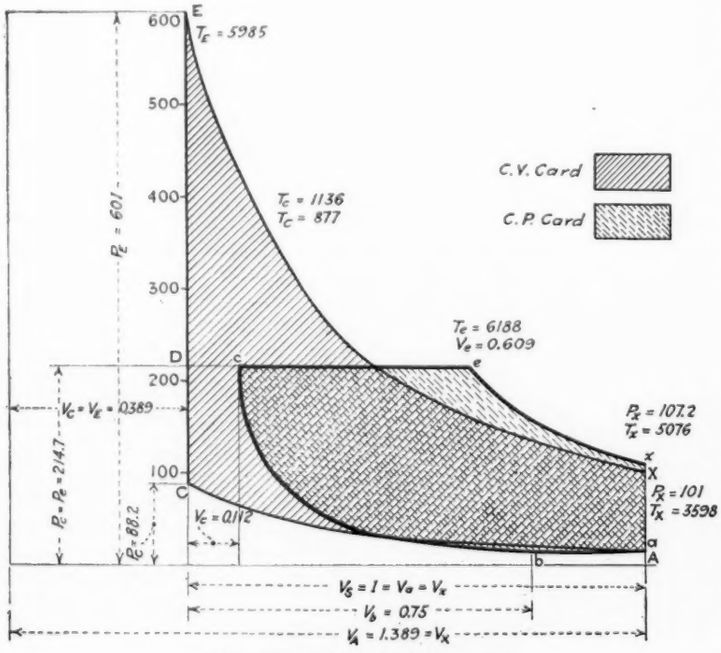


Fig. 1—Two ideal indicator cards

Engines operating upon the constant volume cycle have practical limitations of compression pressure, owing to preignition difficulties and high maximum pressures which do not occur in engines of the proposed constant pressure type.

In the proposed constant pressure cycle the thermal efficiency increases as the load decreases, a most important condition not found in the constant volume cycle.

The proposed cycle renders practicable the utilization of exhaust heat by which means its ideal efficiency is rendered higher than that of any cycle now in use, a fact entirely overlooked by our critic.

The proposed constant pressure cycle is so well adapted to a two stroke cycle that its power output may be made greater for a given bore and stroke than that of the constant volume cycle whether the latter operate on a two or four stroke cycle.

Engines operating upon the proposed cycle are readily adaptable to the use of the heaviest and cheapest liquid fuels which are wholly unavailable in constant volume engines.

The proposed cycle provides means for proportioning the negative work to the work of the cycle. This permits of its use under widely variable loads and enables use of a variable cut-off without throttling.

The proposed cycle also permits of manual modification of two dimensions of the P V diagram. It is thus more flexible than the constant volume cycle.

These conclusions are best proved to practical engineers by comparing the cycles in engines of equal bore and stroke. With petroleum fuels so largely used in modern constant volume oil engines, a compression pressure much is excess of 75 lb. gage is seldom used because of the danger of preignition. Hence an absolute pressure of 6 atmospheres (88.2 lb.) is taken for the purpose of comparison as representing a rather high average. As opposed to this a compression pressure of 200 lb. gage is taken as being a very conservative value for an engine of the constant pressure type, since no serious structural consideration can be advanced against maximum pressures so far below those inherent in the constant volume type. To compare, as does our critic, engines using equal compression pressures is as impracticable as is the comparison of a Diesel engine with one of the constant volume type, using Diesel compression pressures. The constant volume oil engine is necessarily a low compression type while the constant pressure engine is essentially a relatively high compression type.

The two ideal cards shown in Fig. 1 are drawn to scale using strokes of equal length, the compression pressures mentioned above, and starting compression from one quarter stroke in the case of the constant pressure card. That the unloading valve specifically described in our paper provided means for automatically starting the compression at any point of stroke desired, was a point conveniently overlooked by Mr. Napier. The table given herewith shows the varying work areas and efficiencies obtained in other ideal cards with different compression pressures and with compression starting from different points of stroke.

From this table it is at once evident that the ideal efficiency of the constant pressure cycle increases rapidly as the load decreases. In the constant volume cycle the *ideal* efficiency remains constant at all loads but in practice it is a well-known fact that the *actual* efficiency decreases very rapidly as the load decreases. At light load the actual efficiency may fall below-one-tenth that at full load.

As to the question of efficiency, the figures given prove conclusively that in this particular the proposed constant pressure cycle under the conditions outlined has a decided advantage over the constant volume cycle when the saving resulting from the perfectly feasible use of a portion of the exhaust heat* is taken into consideration. Entirely practicable means for such utilization were clearly shown in the description and diagram of the proposed engine. Since the saving in heat thus obtainable will render the ideal efficiency from 25 to 80 per cent higher *than it would otherwise be*, how utterly worthless are the conclusions reached by our critic when he deliberately disregards this saving and then uses this faulty premise as a basis for ridicule! In fact if substantially the same arguments advanced by our critic had been carried to a logical conclusion he would have proved that the efficiency of the Diesel engine is less than that of the constant volume type of engine, whereas we know from long experience that the reverse is true.

The table and cards given herewith show that the net work areas are somewhat less for the constant pressure than for the constant volume cycle. The difference is however almost nil if a somewhat higher compression pressure be taken than that assumed in the constant pressure card shown. This higher pressure *cannot be* used in practice in the *constant volume* cycle without involving difficulties (such as pre-ignition and exceedingly high explosion pressures) not encountered in the constant pressure type.

Furthermore the constant pressure engine lends itself readily to a two stroke cycle. Its power output *per stroke* in this type is substantially the same as in the four stroke type. Hence when running two cycle the power output of a constant pressure engine is greater than that of a constant volume engine of equal bore and stroke, whether the constant volume engine run two cycle or four cycle.

It is a well-known fact that the two stroke constant volume or Clerk type of engine has a power output *per stroke* which is little more than half that per stroke in the four stroke type. This is due in part to difficulties in scavenging without loss of fuel. On the other hand, in the two stroke constant pressure type, running as it does with practically zero clearance, the scavenging may be made nearly perfect, and this without any loss of fuel, since the latter is not added until the beginning of the working stroke. On this basis our contentions that the power per unit of weight of a constant pressure engine may be made greater than that of a constant volume engine of equal bore and stroke, and that for this and other reasons the engine is better suited for automobile propulsion

(*Continued on page* 948)

*Mr. Neilson, in obtaining the figure of 84 per cent ideal efficiency quoted in our paper, contemplated saving a large proportion of the heat in the exhaust gases.

Table I—Comparative Data for Two Automobile-Engine Cycles

Item No.	CONSTANT-VOLUME CYCLE		PROPOSED CONSTANT-PRESSURE CYCLE							
	Symbol	Num. Value	Symbol	NUMERICAL VALUE						
1	$P'a$	14.7	Pb	14.7	14.7	14.7	14.7	14.7	14.7	14.7
2	$V's$	1	$Vs=Va=Vx$	1	1	1	1	1	1	1
3	$V'a=V'x$	1.389	Vb	0.96	1	0.75	0.50	0.25	1	1
4	$P'c$	88.2	$Pc=Pe$	164.7	214.7	214.7	214.7	214.7	264.7	314.7
5	$I'a$	522	Tb	522	522	522	522	522	522	522
6	$V'c=V'e$	0.389	Vc	0.173	0.1490	0.1118	0.0745	0.0373	0.128	0.1136
7	R	0.0391	R	0.02703	0.02816	0.02112	0.01408	0.00704	0.02816	0.02816
8	$T'c$	877	Tc	1052	1136	1136	1136	1136	1207	1269
9	H	91	h	87.5	91.2	68.4	45.6	22.8	91.2	91.2
10	$M'a$	0.1056	Mb	0.073	0.076	0.057	0.038	0.019	0.076	0.076
11	$T'e$	5985	Te	6102	6188	6188	6188	6188	6260	6322
12	$P'e$	601	Pe (see Pc)	.....	.....	.....	.....	.....	.....	.....
13	$V'e$ (see $V'c$)	.....	Ve	1	0.81	0.609	0.406	0.203	0.666	0.566
14	$P'x$	101	Px	164.7	160	107.2	61	23	149.8	141.7
									5320	5034
15	$T'x$	3598	Tx	6092	5676	5076	4316	3271		
16	$W'g$	233	Wg	164.7	209	189.6	152.6	95	242	269
17	$W'c$	35	Wc	65.1	75.2	60.2	44.9	29.9	81.8	87.7
18	$W'n$	198	Wn	99.6	133.8	129.6	107.7	65.1	160.2	181.3
19	.....	.....	hx	43.7	41	26.7	14.4	4.8	37	33.9
20	E	0.399	e	0.421	0.494	0.575	0.638	0.669	0.550	0.586
21	$M.E.P.$	198	$m.e.p.$	99.6	133.8	129.6	107.7	65.1	160.2	181.3

EXPLANATION OF SYMBOLS USED IN TABLE I

The results given in this table are purely theoretical and apply only to ideal cards. The C. P. cycle figures given in Fig. 1 refer, as will be readily seen, to the calculations made for the third column of figures shown under the heading "Proposed Constant Pressure Cycle." All pressures in the table are given in pounds absolute and the temperatures in absolute degrees Fahrenheit. The comparison between the two cycles is for engines of equal displacement with a stroke of 1 ft. and a piston area of 144 sq. in. Exhaust is assumed to take place at the end of the stroke. Certain assumptions have been made in calculating these results. These are explained in the following paragraphs, the figures given at the left referring to the corresponding number under the heading "Item No." in Table I.

1. Both the pressures are assumed; $P'a$ is the initial pressure for the C. V. cycle and Pb is the pressure at the start of compression for the C. P. cycle.

2. Stroke volume is assumed as unity for both cycles. It will be noted that in the C. P. cycle this volume (Va) includes Ve, the volume of the point where delivery to the receiver begins, there being no clearance in the cylinder.

3. The volume $V'a$ is the total cylinder volume and equals also the exhaust volume for the C. V. cycle.

4. Compression and expansion are assumed to be adiabatic. In the C. P. card the unloading valve remains open from a to b, so that the compression (above atmosphere) starts at b. Also $Pc = Pe$ are the pressures at the end of compression and at cut-off respectively.

6. For the C. V. cycle $V'c$ is the volume at both the end of compression and the start of expansion. For the latter $V'c = V'e = V's \div [1 - (P'e \div P'c)]^{0.71} - Vs$. The volume at the end of compression (Ve) equals $Vb\ (Pb \div Pc)^{0.71}$.

7. The constant R for the C. V. cycle is $P'a\ V'a \div T'a$. For the C. P. cycle $R = Pb\ Vb \div Tp$.

8. $T'c$ and Tc are the temperatures resulting from adiabatic compression. $T'c = P'c\ V'c \div R$ and $Tc = Pc\ Vc \div R$.

9. Heat added in C. V. cycle is assumed to be that resulting from complete combustion of a quantity of fuel having a weight equal to one-fifteenth the weight of air present. Calorific value of fuel is assumed to be 18,000 B.t.u. per lb. In the proposed C. P. cycle a portion of the heat added is recovered from the exhaust gases. (See note 18.) H and h are expressed in British thermal units. $H = 18{,}000$ wt. area $\div 15$ and $h = 1200\ Mb$.

10. Weight of gas heated in C. V. cycle includes products of combustion remaining in clearance space, the specific weight of which is *assumed* for convenience to equal the specific weight of air, approx. 0.076 lb. per cu. ft. at 60 deg. F. and 14.7 lb. abs. pressure. In the C. P. cycle gas heated is all air in a cylinder with zero clearance-volume. The volume of gas heated is controlled at will by varying point of cut-off. $M'a$ and Mb are the pounds of gas and air respectively heated. $M'a = 0.076\ V'a$. $Mb = 0.076\ Vb$.

11. For convenience in figuring, $T'e$, Te and hx (see note 19) are determined on the *assumptions* (a) that the specific heat of the products of combustion is the same as the specific heat of air, and (b) that the specific heat remains constant throughout the temperature range. The specific heat of air at constant volume is taken as $Kv = 0.1689$ and at constant pressure $Kp = 0.2375$. The temperature of expansion ($T'e$) equals $T'c + (H \div M'a\ Kv)$. The temperature of cut-off (Te) equals $Tc + (h \div Mb\ Kp)$.

12. While $P'e$ is high in the ideal card, its actual value in practice is known to be much lower than 600 lb. Pc, the maximum pressure attained in the C. P. card, can be controlled at will by simply varying the pressure on the unloading-valve spring. The explosion pressure is $P'c = R\ T'c \div V'c$.

13. The volume at cut-off (Ve) in the C. P. cycle equals $Te\ R \div Pc$.

14. $P'x$ and Px will both be much lower in practice than the theoretical value noted. The pressure of exhaust in the C. V. cycle ($P'x$) equals $P'e\ (V'e \div V'x)^{1.4}$. For the constant pressure cycle $Px = Pe\ (Ve \div Vx)^{1.4}$.

15. The theoretical values of $T'x$ and $T'x$ (as well as $T'e$ and Te) are also much higher than in practical engines. The temperatures of exhaust for C. V. and C. P. cycles are respectively $P'x\ V'x \div R$ and $Px\ Vx \div R$.

16. The gross area is the total area under upper lines of respective cards. The gross area of the C. V. cycle is $2.5\ (P'e\ V'e - P'x\ V'x)$. For the C. P. cycle it is $Pe\ Ve + 2.5\ (Pe\ Ve - Px\ Vx)$.

17. Negative work is the work of compression in C. V. card and work of compression and delivery in C. P. card. The negative area for the C. V. cycle is $2.5\ (P'c\ V'c - P'a\ V'a)$ and for the C. P. cycle is $Pc\ Ve + 2.5\ (Pe\ Ve - Pb\ Vb) + Pb\ (Va - Vb)$.

18. In the third C. P. card the net work is close to its maximum value when $Vb = 0.75$, hence little is gained, with 214.7 lb. compression pressure, by starting to compress earlier and by cutting-off later. The net work area for the C. V. cycle is $W'g - W'c$ and for the C. P. cycle $Wg - Wc$.

19. Piston area = 144 sq. in. One B.t.u. = 778 ft. lb. hx is determined by assuming that the exhaust gases will heat the air supplied to a temperature midway between Tc and Tx. The heat recovered from the exhaust (hx) in the C. P. card equals $0.5\ (Tx - Tc)\ Mb\ Kp$.

20. Thermal efficiency is the ratio of net work done to *net* heat added by fuel. The C. V. thermal efficiency is $144\ W'n \div 778\ H$. For the C. P. cycle e equals $144\ Wn \div 778\ (h - hx)$.

21. The mean effective pressures equal $W'n \div V's$ for the C. V. cycle and $Wn \div Vs$ for the C. P. cycle.

The Automobile and Truck Industry In Switzerland

War Has Exerted Marked Effect on the Country—Occupations of People Greatly Changed—Many Plants Have Turned to Motor Vehicle Construction—Sales Opportunities

By E. A. Langdon

ALTHOUGH not involved in the world war, Switzerland, like many other neutral countries in Europe, has been doubly busy since August, 1914. The effects of the war are very clearly visible on life in Switzerland, which is surrounded on all sides by belligerents; and, while officially this Helvetian republic is identically in the same situation as during the first six months of 1914, as a matter of fact the past two and one-half years have witnessed striking changes in the life, occupation and methods of work and business of the people of Switzerland.

To begin: There has been considerable change in the occupation of the people. Before the war a great division of the nation was kept busy attending to the many tourists who visited the country. These people were reduced to idleness almost immediately by the outbreak of the war. Then there were a great many industries, such as lace making, which from the first day of the war on found it difficult both to dispose of the products and to obtain new raw materials for carrying on the work. Thus, thousands of people were forced to look for a different mode of occupation.

Practically No Car Imports

As for importing automobiles into Switzerland, this trade is at present practically nil, because there are sufficient facilities for making all the machines the country requires. Moreover, any merchant wishing to import automobiles would find this a very difficult matter, and practically impossible, for he would be required to furnish a more than ironbound guarantee that the vehicle would in no way be made serviceable, directly or indirectly, to the Central Powers. This is, at the present involved state of Swiss industries, almost an impossibility, because the bulk of Swiss industries are occupied with war contracts of some kind or other, and, all denials to the contrary notwithstanding, the relations between manufacturers supplying the Allies and those working for the Teutons are extremely amicable; hence, the country being anything but divided along lines of the two sides in the war, it would be very difficult to promise that a machine would never be used by someone tied up with the opposite belligerent.

However, while, as just stated, there is practically no importation of automobiles into Switzerland, it is safe to prophesy a considerable trade of this nature for the post-bellum period. The reasons are:

Modernization Going On

Switzerland is being modernized by the war more than it was during the twenty-five years preceding it; industry will be much enhanced; modern ideas will enter the minds of the people, who up to a short time ago were still, in some ways at least, rather conservative. Such a development cannot help creating an increased demand for automobiles. The machines required will have to be well adapted to the peculiar local conditions of this alpine country; the cars will have to be built with low center of gravity, good hill-climbing ability, and a view to the greatest possible fuel economy; they will have to be medium-priced, light, and strong; they will have to be covered by a reliable maker's guarantee; the purchaser will require the presence, within a few hundred miles, of a supply station of reserve parts; the machines will be expected to have complete equipment; they will be easier to sell if they are fitted with large-size tires; they will, considering the standard of quality, have to compare well with French and German makes, which are well known in Switzerland, and which, even if a little dearer, will be given preference in many instances—other things being equal; in short, American automobile makers working for Swiss business will have to win the confidence of the shrewd population of that country.

A Cosmopolitan Center

It would seem, perhaps, that the results of such endeavors could never be proportionate to the efforts, because of the small size and population of the country. This is, however, a very narrow view to take of the situation. In normal times Switzerland is a meeting ground of all Europe, at least at certain times of the year; and an automobile displayed and doing good work in Switzerland serves to advertise one's products to Danes, Poles, Russians, and inhabitants of the Balkan territories. There is nothing which counts as much in European eyes as "the proof of the pudding," and the work of a machine which stands up well under the strenuous requirements of Swiss touring is bound to impress a prospective buyer of automobiles.

In one respect Swiss business is much easier than in other continental countries. Due to the intense contact with foreigners, the number of Swiss who have a command of English is surprisingly large, and it is hardly necessary for a salesman to speak the native language of the particular section of Switzerland he visits.

A Good Light Car Market

It is also possible that after the war there may be a pretty good market for light automobiles, specially suitable for doing occasional dairy work, which can be jacked up and connected to a separator or such implements. As to plowing machines, hoes, etc., the industries requiring such machines are so small that it would hardly pay to carry on a sales campaign for the introduction of such machinery.

All in all, there is no doubt that Switzerland, too, will be a much more important market after the war than before.

The Call for Cars

Speaking of the call for automobiles: The demand from belligerent countries requires no further elucidation. All belligerent nations are anxious to get into their possession as much automobile equipment as possible. Money is no object. The requirements in Switzerland are also created directly by the war. The first circumstance calling for

automobiles is that the supply of freight cars on Swiss railroads is none too ample to transfer the much-increased output of the nation's industries. Motor trucks are needed. Furthermore, there is also an increase of passenger traffic, and while it is almost impossible to obtain statistics at present, when the figures will once be given out they will in all likelihood exceed the foreigners' traffic of peace times. Everyone knows what these remarks refer to. Switzerland has not only become, during these months of war, a highly industrial and efficient manufacturing country, but it has rendered splendid service as an enormous hospital for wounded prisoners who are either sent there to stay or pass through the country to be exchanged as invalids. These men number by the myriads, and naturally require very large transportation facilities.

Troop Transport Requirements

But there is another circumstance which adds to the demand for automobiles. While at peace, Switzerland is at present really on a war footing; many thousands of citizens are continually on border duty. This service includes a very large number of military posts on the alpine peaks on every side of the country, and as the men on duty are there only for short periods the transport of these troops, as well as the supply of food, necessitates the use of numerous motor vehicles.

Thus, in spite of the paralyzing of some industries, the whole population of Switzerland is kept busy, and the automobile is not the least factor responsible for this agreeable state of affairs.

Mention has been made of the difficulty of obtaining raw materials, because each belligerent supplies Switzerland with some materials, but insists that this must be used in no way advantageous to the enemy.

The Allies make the supply of cotton, rubber, etc., dependent on this condition.

The Central Powers take much the same stand with regard to the coal, steel, and oil they supply to the Swiss.

Vehicles of the Truck Type

Time and again the Federal Government has received notes on this subject from both sides; but it would seem—and this opinion has been voiced unofficially by a number of people who are in well-informed places and with whom the writer had interviews—that these notes are sent out by the belligerent governments with the chief intention toward home consumption, while every government in Europe is very glad that Switzerland is neutral and in all probability will remain so until the end of the war.

The machines, as already indicated, are principally built along truck lines, even where they are used for transportation of wounded or invalid prisoners, and where motor vehicles of this type are used they are, as a rule, built on the sightseeing style, which allows for a great number of passengers on one machine. However, there are also special bodies, such as large ambulance wagons, permitting the transport of eight, ten, or twelve men on stretchers. All these trucks are covered and equipped with doors or gatework.

Many Passenger Cars

In spite of the large number of trucks, however, there are a great many passenger vehicles proper being built and used. These machines vary in design and construction, depending on the purpose for which they are destined. Automobiles constructed for field work are as a rule constructed as lightly as is possible for the work they will have to do, and are distinguished by simplicity of design and ample ground clearance, seeing that they will have to do a great deal of work on very poor roadways.

It is a different matter with Swiss trucks. They are built along lines somewhat similar to those existing before the war and are heavy and solid in construction. The reason may be that Swiss engineers have not as yet been benefited by and drawn conclusions from the frontal experiences; but one of the reasons, no doubt, is that the powers purchasing these trucks realize the careful selection of material and labor used in constructing these trucks and order them with a view to specially hard work, such as transporting heavy ordnance, etc. Among the factories specially well adapted for such manufacture are a number of locomotive plants of international repute, although in their case it is not a matter of a factory having changed its complete character, for, of course, there is still a great market for railroad engines in all countries surrounding Switzerland. It would seem, however, that the making of automobiles, especially at the present, is more profitable, offering a fine incentive to all such plants which possess modern machine tool equipment.

Little Munitions Produced

One reason why automobile making has become such a big industry in Switzerland since the beginning of the war is the fact that the Swiss turn out very little munitions, properly speaking. Certain industries, such as watchmaking, which has lost a good deal of its export trade on account of the rise in transportation rates throughout the world, has taken up the making of munition accessories and parts, but none of these is assembled in Switzerland itself; they are sent to the countries of the Entente or Dual Alliance, as the case may be, where they are put together, or fitted together with products of the countries which purchase them. Therefore, the practice of fitting up any old blacksmith shop as a munition factory, as has been done in some countries, does not hold good in Switzerland.

Difficulty in Securing Materials

As mentioned above, there is always a certain difficulty about getting the materials for making automobiles, although this holds true of all kinds of materials, whether they are produced in Switzerland or imported from outside. Hence, the prices of automobiles are very much higher than before the war and seem to be continually on the rise; and, to make matters worse, the sources of materials imported by the Swiss for the purpose of manufacture and export are continually being restricted so as to raise the price of the articles sold to the enemy of the country which happens to sell to Switzerland. The prices of tires and of gasoline are in no way behind those of automobiles, and, if possible, rise more rapidly.

People Want Peace

These facts explain that, while every man in Switzerland is employed and making splendid money, compared with the ante-bellum days, there is not one in the republic who does not hope for the earliest possible close of the war. The Swiss seem to have their doubts as to whether their war-born prosperity will survive the war; but even so, they consider that the general expense of living among a crowd of fighting peoples is far in excess of the benefits. When you ask a Swiss business man for figures he shrugs his shoulders and tells you how many hundred per cent. the national debt per head has increased during the war, due to the need of preparedness all along the border.

Roads Greatly Improved

One of the blessings of the war is a general improvement of Swiss roads. There are now much more motorable roads than before the war. Not that Switzerland was poor in good roads before the war; but there were not enough in proportion to the attractions that country offers to motoring tourists. Furthermore, there were before the war a great number of roads shut to automobile traffic. The war has, in this respect as in so many others, been a great educator to the people in dispelling some old-fashioned prejudices; and in all likeli-

(*Continued on page* 944)

The FORUM

Horsepower Curves for Tractors

By B. W. Moses

THE necessity for an accurate and simple rating for tractors is a subject that is attracting considerable attention at present. When the term 20 hp. is used it may mean almost anything, one manufacturer takes it to mean the actual power at the draw bar, another to mean the number of horses the tractor will actually displace, another the brake horsepower of the motor, while another may even take the A. L. A. M. rating.

In the computation of power the two quantities that must be measured each time are the pull at the draw bar and the speed of the tractor (not of the engine). These two quantities can easily be obtained, the first by some kind of spring scale and the latter by the expedient of laying off distance stakes.

Knowing then that mechanical horsepower is the result obtained by dividing the product of pull in pounds and the distance traveled in feet per second by 550 it is very easy to obtain:

Hp. = 2.666 × pull in thousands of pounds × M.P.H.

And as an approximate rule it might be taken that the horsepower is equal to five times the pull in tons, times the speed in miles per hour.

In the accompanying diagram the draw bar pull in thousands of pounds is laid off horizontally and the mechanical horsepower is laid off vertically, while the radial lines are speed lines. To obtain the horsepower follow the line vertically that corresponds to the draw bar pull until it intersects the proper speed line, then the horsepower is on the horizontal line passing through that point. For example: What is the horsepower of a tractor pulling 5000 lb. and traveling at the rate of 3 m.p.h.? Answer: 40. Follow the lines *A*—*B*.

On the extreme left of the chart the equivalent horse pull is laid off. This horse pull is based on an animal that will exert a pull of 185 lb. while traveling at the rate of 2¼ m.p.h., and is equal to 1.08 mechanical horsepower. If for example it is desired to know what the equivalent horse pull for the above case is, simply extend the line *B* to the left, obtaining a little over 36 horses.

Another feature of the diagram is that of converting feet per hour to miles per hour or vice versa. On the extreme right the speed is laid off in thousands of feet per hour. And through the center of the diagram running vertically is a heavy line. This line might be called the speed line. The speed in feet per hour can be converted into miles per hour by simply finding the radial line passing through the point of intersection of the line expressing the thousands of feet per hour and the speed line. If in the above example the speed had been given as 15,840 ft. per hour instead of 3 m.p.h., the line *C* converts the distance into miles per hour and the problem is the same as before.

The diagram can be used for any power machine at any speed. If however the speed or the power is too great to be found on the diagram, it should be divided by some factor that will bring it down onto the chart and the result is to be multiplied back by the same factor, thus giving the correct power or speed required.

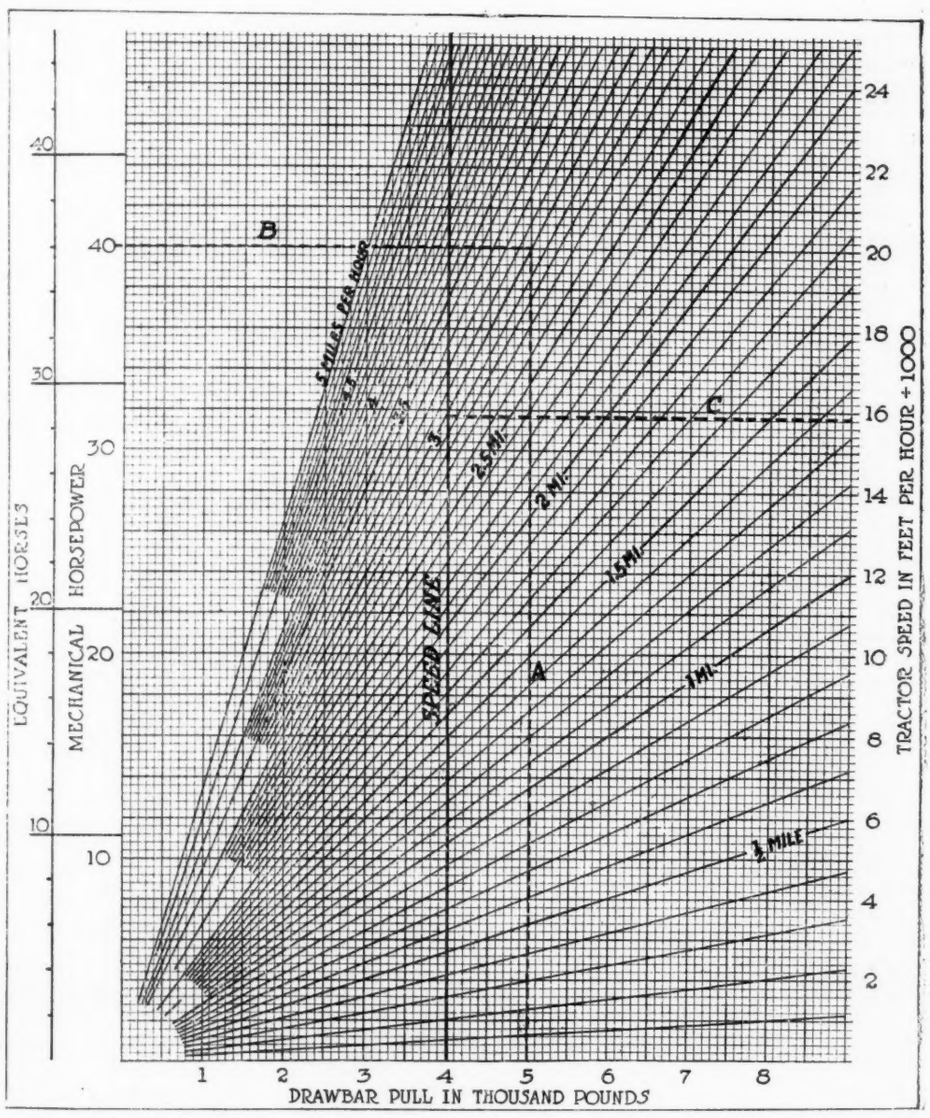
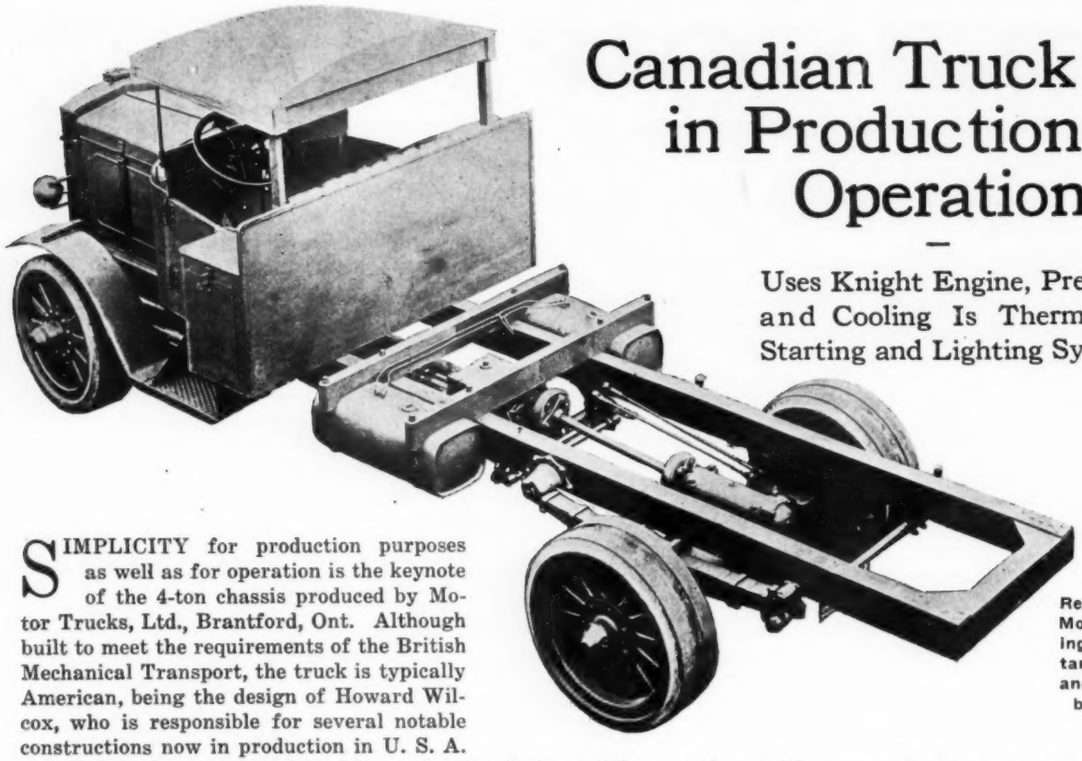


Diagram showing relation between horsepower and speed of motor tractors

Canadian Truck Simple in Production and Operation

Uses Knight Engine, Pressure Oiling and Cooling Is Thermo-Syphon—Starting and Lighting System Fitted



Rear of chassis built by Motor Trucks, Ltd., showing the two 20-gal. fuel tanks, overhead worm and strong frame members. Note roomy cab

SIMPLICITY for production purposes as well as for operation is the keynote of the 4-ton chassis produced by Motor Trucks, Ltd., Brantford, Ont. Although built to meet the requirements of the British Mechanical Transport, the truck is typically American, being the design of Howard Wilcox, who is responsible for several notable constructions now in production in U. S. A.

A Knight four-cylinder 4 by 6-in. engine is a feature of the design, which is a worm-drive construction with a 159-in. wheelbase and a gear ratio in high of 8¾ to 1. Tires are 36 by 5, dual in the rear.

Fundamentally the chassis is simple. It is also silent and embodies a high degree of flexibility. In the frame—the very backbone of the truck—there is primarily simplicity, since there are no rigid cross-members save at the extreme rear end, where there is one large one to carry large gussets to maintain the rectangularity of the frame. It is cold pressed of ¼-in. stock, 7 in. deep, with 4-in. flanges.

This simplicity makes for ease and economy of assembly, it makes for accessibility to the parts and it makes repairs less difficult. By this simplicity the third characteristic of the design—flexibility—is secured, for with all of the cross-members, and only a few at that, of the tubular type, the frame becomes a true De Dion form, which, continuing the chain of cause and effect, permits the use of very flat springs.

These flat springs are accountable to a large measure, according to Mr. Wilcox, for the success of the Hotchkiss drive.

The greatest contribution to silence, as well as the most distinctive feature of the truck, is the Knight engine which is of the same type as adopted by the Fifth Avenue Coach Co. for its new buses, and built by the Moline Motor Car Co., Moline, Ill. It has four cylinders, 4 by 6, giving a formula rating of 25.6 hp., but having shown 65 hp. at 1800 r.p.m. on the block.

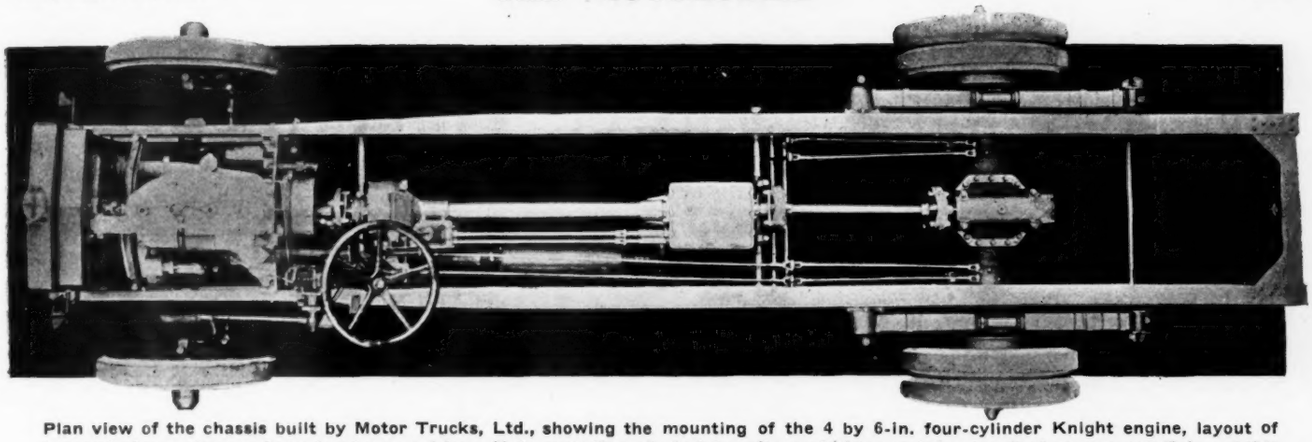
Cylinders are cast in block, together with the inlet manifold, which is completely water-jacketed. The sleeves are so placed in the cylinder that their upper ends are incased by waterjackets on both sides, and they are operated by eccentrics in the usual manner.

Pressure lubrication is secured from a gear-pump, forcing the oil through the drilled crankshaft to main and connecting-rod bearings at pressures up to 50 lb. per sq. in., which vary with the speed, thus providing automatic gradation of the oiling. There is no splash, but the spray from the cranks serves to lubricate the eccentric shaft and the wristpins. The wristpins are hollow and serve to convey the oil to the sleeves, which are oil-grooved and drilled and which in turn work the oil thoroughly between themselves and the cylinders.

Thermo-syphon water circulation is used and by dint of exceedingly liberal water spaces in the cylinder block as well as unusual radiator capacity, a somewhat sluggish circulation is made to have a cooling effect equal to a more rapid forced system through smaller passages. The radiator has unusual height, so that an excellent head of water is secured. Besides this, the top tank extends some distance above the top water header, so that an increased head is provided. The lower headers are two in number, one conducting the cool water to the front of and the other to the back of the cylinder block.

The radiator casing is entirely cast, comprising four pieces, the large top tank, a smaller bottom tank and two side plates.

A complete truck climbing a difficult grade. Note the high radiator and hood, the searchlight mounted on the dash and the substantial bumper bar



Plan view of the chassis built by Motor Trucks, Ltd., showing the mounting of the 4 by 6-in. four-cylinder Knight engine, layout of transmission system and overhead worm drive. Note mounting of electric units, amidship gearbox, etc. Springs are very flat, and this renders the use of Hotchkiss drive a logical feature

The cooling system has the unusual capacity of 17½ gal., most of which is in the radiator. The core of the radiator is of helically-finned copper tubes, individually demountable and sealed by cork gaskets without solder. The top and bottom plates are of copper or brass plate.

A high-tension single magneto with fixed spark cares for ignition automatically. The auxiliary electrical system consists of a Wagner starting and lighting outfit, with the generator and motor separate. The generator is driven from the same shaft which drives the magneto, this shaft being driven from within the timing gearcase by the same silent chain which drives the eccentric shaft gear from the camshaft. It also drives the V-belt for the 20-in. three-bladed cast aluminum propeller-type fan.

The starting motor, which drives the flywheel through teeth milled on it, was selected by testing for a motor powerful enough to start the Knight engine after being in cold storage at a temperature below zero for 24 hr.

The carbureter is a Zenith, which harmonizes very well with the rest of the chassis, since it has no adjustments, valves or springs. Incorporated with the carbureter is the Monarch gas-velocity governor, which operates without outside mechanical connections of any kind. The adjustment of this governor is easily made and is locked with a padlock, so that the driver cannot change it. In its setting, established precedent has been set aside, since it permits the motor a speed of 1800 r.p.m. It is said that the truck may safely be driven for a distance not to exceed 10 miles at 30 m.p.h., and for an indefinite time at 25 m.p.h.

The carbureter is fed by pressure from two tanks, mounted in an original manner. These tanks are 12 by 14 in., of bolster shape, each made of two seamless drawn steel shells, telescoped and welded. Each holds 20 gal., and they are suspended by steel straps from two yoke-like wood beams laid across the frame, so that the tanks lie just outside the frame side-members back of the cab. Pressure is automatically maintained by an air-cooled two-stroke air pump driven by the engine.

Gearbox Is Amidships

Unit power plant construction is not used, since on long wheelbases it is desirable to divide the shaft into two lengths to avoid whipping. This can be done with the best distribution of weight by placing the gearbox amidships. This also permits of greater accessibility and also allows the unit transmission embodied in this design to be employed. The engine is therefore independently mounted on three points, direct from the main frame.

Between it and the transmission unit is a fabric disk universal. The transmission unit comprises the clutch, gearbox, control unit, intermediate driveshaft and brake rocker-shafts assembled into a rigid unit, independent of the rest of the power and driving system. It is suspended on three spherical joints, one at the front, on a tubular cross-member and two at the rear, on the side members. At the front is the clutch housing.

The clutch is a Brown-Lipe dry-disk type, designed to run without oil and of such proportions as to be uninjurable through slipping. It connects with the Brown-Lipe gearbox by a long tube, inclosing the driveshaft.

The gearbox is square with a light removable cover on top. It affords four speeds and one reverse. The gears and shafts are nickel steel, heat-treated and the gears are of 5-7 pitch with 1¼-, 1½- and 1⅝-in. faces. An interlocking arrangement is provided to prevent engagement of more than one pair at a time.

A Rigid Assembly

Back of the gearbox is a tubular cross-member, rigidly attached to the back of the gearbox and, paralleling it are two brake rocker-shafts. Just back of the clutch at the front end is the selector or control unit for the gearset. The shifter-rods connect it with the gearset, and, due to the rigid assembly of the whole transmission unit, correct alignment is assured.

To a bracket at the side of the clutch the hand brake lever and the pedal are attached, their pull-rods to the brake rocker-shafts extending back in straight lines. The single pedal is mounted on the clutch throw-out shaft direct and carries a brake pull-rod besides, so that it fulfills the double duty of clutch release and foot brake.

Behind the gearbox the final or secondary drive is taken by a 26-in. solid shaft with two fabric-disk universals, to the worm-driven rear axle. This is essentially a Sheldon type, except that it has some special features of its own. One of these is the M & S worm self-locking differential. A number of trucks have also been built by this concern without any differentials. These axles have cast steel housings, side-by-side internal brakes and are of semi-floating construction.

The springs through which the torsion and propulsion are transmitted are of the banded type, steel bands being shrunk on at their middles in lieu of a center bolt, thus avoiding any weakening hole at this point. They are flat under load and have three reversed leaves on top to resist rebound. These rebound springs are equal to about one-fourth the thickness of the main springs. The front springs are 44 in. long and 3 in. wide and their eyes are bushed for ¾-in. diameter bolts. Rear springs are 56 in. long and 3½ in. wide, bushed for 1¼-in. bolts at their fronts and for 1-in. ones at the rear, or shackled end. Three rebound clips are used on each spring.

The axle clips are of the round type, bent in an arch over the springs without sharp bends, an iron filler block being inserted between them and the tops of the springs. The

(*Continued on page* 944)

Westinghouse Club of Practical Value

Technical Education of Employees Developed by Special Classes—Athletic Activities and Social Features Provide Ample Recreation

WELFARE work at the plant of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has grown to a high state of efficiency in regard to educational, social and physical benefit to the employees. Organized in 1902, primarily for the educational benefit of the engineering apprentices, the Westinghouse Club has widened its scope so as to include membership not only from the above company, but also from the Westinghouse Air Brake Co., the Westinghouse Machine Co., Pittsburgh Meter Co. and the Union Switch and Signal Co. The membership now includes something like 850, mainly of the younger engineering students. Membership, however, is open to any factory employee, but owing to its having been organized primarily for the benefit of the technically trained students this class has so far predominated in the membership.

When the club was first organized its activities were mainly lectures on technical subjects, and the establishment of a reading room. Subsequently the club expanded and quarters were purchased where reading rooms, billiard and pool parlors and a completely equipped gymnasium were installed.

Membership in the club is recruited from all of the Westinghouse companies in the Pittsburgh district. The club offers an increasing scope of acquaintanceship among men other than those whom the average member meets in his business relations. It is interesting to note that the club membership during the current year includes men from over 160 different colleges and universities.

Committees Handle Activities

The activities of the club throughout the year are taken care of by specially appointed committees covering athletics, entertainment, technical sections, house, lecture, library, music, excursion and smoker.

The club also extends its operations beyond the factories in an endeavor to afford educational and instructive advantages. The work of the excursion committee is the best exemplification of this and is probably the most interesting work of the club to the new members. Excursions are made to the various manufacturing plants in Pittsburgh. These excursions cover a variety of different classes of manufacture and are conducted under the guidance of experts in the various lines. Provision is made for men on night turn to take these trips on Mondays.

Technical Work Important

One of the most important works of the club consists in the organization of regular classes for the systematic study of the theory, design, and application of the Westinghouse apparatus. Organized primarily as an educational institution, the club management has always felt that the opportunities for study and technical lectures and discussions could not be made too great. No other branch of the club work has been so popular, the enrollment in all the technical sections through the year totaling 951, some men taking work in two sections. The object of the sections is to supplement work in the factory classrooms and in the shops. The classroom work during the first part of the graduate students course takes up the construction and manufacture of apparatus, while shop work covers its actual manufacture. It is the intention of the club to have the members of the section prepare the papers or lectures and enter into the discussions and thus learn by actually performing the work. Beginning this year, a time allowance of 25 hr. per each half term toward completion of the apprenticeship course is made for each graduate student who does the work of a technical section to the satisfaction of the leader of the section.

Gymnasium Completely Equipped

For 2 years now, the club has had its present large gymnasium facilities and has thus been able to develop various athletic teams. The gymnasium room is 65 by 140 ft. and is equipped with the latest forms of athletic apparatus. The floor is also laid out for basketball, indoor baseball, three removable handball courts, and a banked running track with sixteen laps to the mile. Outdoor athletic activities are centered in baseball, tennis, and field sports.

The library has become an important part in the club life. Daily newspapers from all sections of the country are on file, so that every club member can keep in touch with the section from which he comes. A complete file of technical magazines is available. Sectional bookcases are added from time to time as the number of books secured increases. The reading room is visited, according to statistics, by more members than any other room in the house.

As a means of furthering acquaintance and good fellowship among its members, the entertainments held during the year are of great importance. This year in order that those in charge of entertainments could give more attention to the dances and special events a Smoker Committee was appointed to arrange for Apprenticeship Nights and Monthly Smokers.

The lectures have proved a feature of the club life due to the wide range of popular subjects. The idea of these lectures is to afford the members and their friends a means of keeping posted on the topics before the public, and to avoid technical subjects.

The technical man's ability along musical lines is demonstrated by the active interest taken in the various musical organizations fostered by the club.

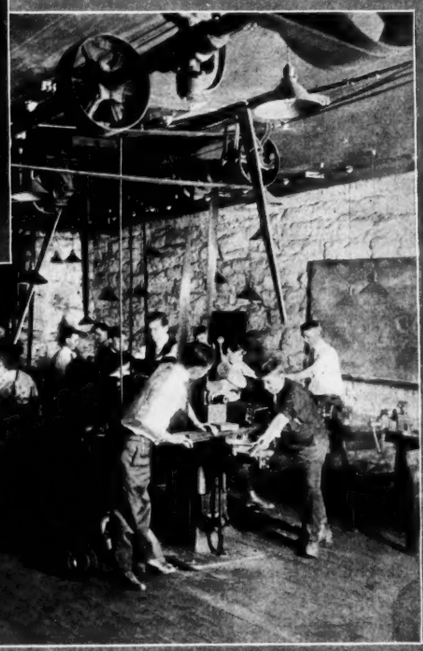
Club Organization

The club is operated by a board of directors, three of whom are appointed by the company and three elected by the members, one each of three appointed by other companies and the president, vice-president and junior past-president who are elected by the members to these respective offices and thereby become ex-officio members of the board.

A paid manager and assistant manager are employed who devote their entire time to the club. It is the hope of the management that some time the company will have a building devoted to all of the welfare interests, including both the workmen in the shop and those in the offices. In the meantime the company is providing a number of different welfare methods, as told in previous paragraphs. One of the most active and beneficial is the Casino Technical Night School operated under the auspices of the company which affords instruction in the evenings for those employed by the company and others as well, at purely nominal rates. This is open to girls as well as boys. A banner attendance in this department has been made this year, something like over 850 students having matriculated.

Educational Activities of the Westinghouse Club

Below — Practical instruction supplements the work of the classroom in the technical educational courses of the Westinghouse Club. The illustration shows one of the sections at work in the machine shop where the students can see the working out of the theoretical matter which they have studied



Above—One of the technical sections at work in the drafting room, receiving instruction in the preparation of details of construction of apparatus produced in the Westinghouse plant

Above—The gymnasium is 65 by 140 ft., and is equipped with the latest forms of athletic apparatus for regular class and exhibition work. The floor is also laid out for basketball, indoor baseball, three removable handball courts, and a banked running track with 16 laps to the mile

Right—One of the technical sections of the club at work in testing out electrical apparatus

The Automobile Industry in Switzerland

(*Continued from page* 938)

hood the automobile restrictions will be completely removed after the end of the war. There will be other progress in this respect, too, unless indications are misleading. Most likely there will be far-reaching license reciprocity with the neighboring countries, especially France and Germany, so that touring in Switzerland will be still easier, and foreign tourists will be attracted in numbers to make up for what the country has lost in this regard during the war. Already there is a good deal of discussion regarding more modern methods of coping with tourist business; plans are being made for construction of garages where before the war automobiles were kept out, and an intense automobile traffic is confidently looked forward to.

This analysis of the automobile situation shows to what an extent it has been necessary for the greater part of the population to find new occupations and for a great deal of manufacturing capital to turn to new fields of endeavor.

Turn to Car Building

To take up the last point, a number of factories whose entire or chief output consisted in embroidery and knitting machines have devoted practically all their attention to the manufacture of automobiles. In this course they have followed the example of one maker in Arbon, who during the past ten years had turned out quite a number of automobiles, especially commercial cars, which were highly successful, not only in Switzerland, but throughout Europe, and even outside the continent. At present this company makes automobiles only and has quite suspended the manufacture of textile machinery.

Smaller Manufacturers Interested

Such an example could not help stimulating kindred efforts on the part of smaller manufacturers, and this accounts for the great increase of automobile making in Switzerland. Needless to say that the call for automobiles, both in Switzerland and especially in belligerent countries, is so great that the automobile industry is very profitable, and that whoever is in possession of suitable machine tools endeavors to produce motor vehicles. There is, however, one important limitation to these endeavors, namely, the difficulty of obtaining raw materials.

Canadian Truck Simple in Design

(*Continued from page* 941)

shrunk-on bands are machined to accurate size to fit grooves in the spring perches, so that they transmit the propulsion instead of the clips.

Wheels are of wood, with square spokes, fourteen on the rear and twelve in front. The same sizes of tires are used front and rear, namely, 36 by 5, single in front and dual behind.

The steering gear, is on the left side. It is attached to the main frame side-member and has a steering column angle of 35 deg.

Great pains have been taken in the finish of this job. The hood is made of 16-gage steel in three sections. The top section is hinged to the dash and the side sections to the frame sills and detachable. The hold-downs are two in number, being forged and connected with the frame sills by springs to keep the hood tight and prevent rattling and at the same time allow for the movement of the radiator on its flexible mounting in response to frame weaving.

Fenders and steps are of 14-gage steel, pressed from one piece and held in place by heavy cast braces riveted to the tops of the fenders. A simple bracket of bent sheet steel supports the running board. The headlights are attached to forks extending horizontally on each side of the radiator.

The cab is constructed entirely of steel and has a seat wide enough for three large men. On each side of the seat is a large tool box and across the back is a wide bulkhead.

Some of the other ratios, speeds and dimensions are:

Gearset Ratios

First	4.84 to 1
Second	2.84 to 1
Third	1.50 to 1
Fourth	direct
Reverse	5.81 to 1

Total Gear Reductions

First	42.35 to 1
Second	24.85 to 1
Third	13.12 to 1
Fourth	8.75 to 1
Reverse	50.84 to 1

Truck Speeds in M.P.H.	R.P.M. 1,800	1,000
First	4.57	2.54
Second	7.76	4.31
Third	14.68	8.16
Fourth	22.05	12.25
Reverse	3.78	2.10

Dimensions

Loading space back of driver's seat	12 ft. 3 in.
Track, front	60½ in.
Track, rear	67 in.
Chassis overall length	20 ft. 3 in.
Height to top of frame	32 in.
Overall width	7 ft.

Scripps-Booth Detachable Winter Top

THE detachable winter top illustrated at the right on the eight-cylinder Scripps-Booth is designed to appear as an integral part of the car, although it may easily be removed and the regular top mounted. The detachable top fits closely to the body of the car, with flush sides and will not rattle. Windows are removable and the interior is finished in gray whipcord with a dome light. Both the winter top and the regular top are furnished with the eight-cylinder model for $1,350, *the price without the winter top being* $1,175.

Detachable winter top mounted on the Scripps-Booth eight-cylinder chassis

ACCESSORIES

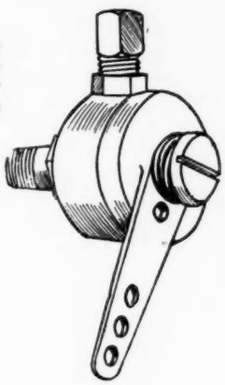
Primolite Headlight Lens

BY a prismatic construction this lens throws the greater part of the light upon the road straight ahead but diffused in such a manner that the driver can see cars coming from the opposite direction and also the road on both sides of the car, so that the danger of passing is eliminated. Light rays run to each side almost at right angles from the face of the lens, so that objects on both sides of the driver are distinguishable at a distance of 50 ft. back from the road. Each lens is divided into a series of vertical divisions, each of which is a convex lens, and as the face of the lens is frosted the convex divisions each throw the rays at diverging angles, these rays crossing and re-crossing those shining through the frosted portion, thus mellowing the light. For 8 to 9-in. headlights the lens sells for $2.90; for 9 to 9⅞ in., $3.50, and for 9⅞ in. up, $4.20.—Primolite Company, 945 Lemcke Annex, Indianapolis, Ind.

Primolite headlight lens which is designed to throw light upon the sides of the roads as well as straight ahead without glare

Hydrovaporizer

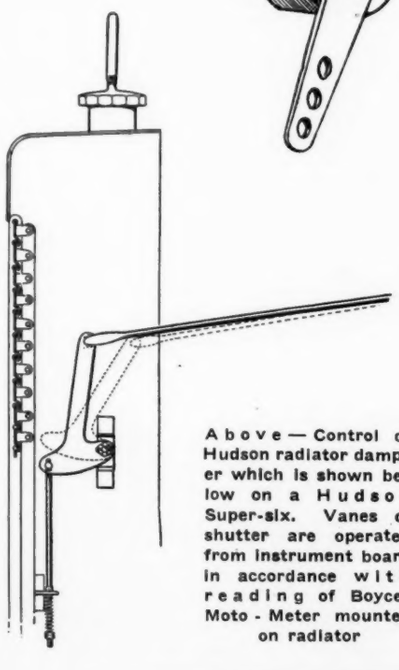
A mixture of water and air is injected into the intake manifold by this device. Water is drawn from the engine and air from the outside, mixed in the chamber of the device, and carried into the combustion chamber in a fine spray, it is claimed. The proportion of air and water may be controlled from the seat, and it is said that the efficiency of the engine is bettered and carbon prevented. Price, $6.—Accessory Mfg. & Sales Co., 1507 Hennepin Avenue, Minneapolis.

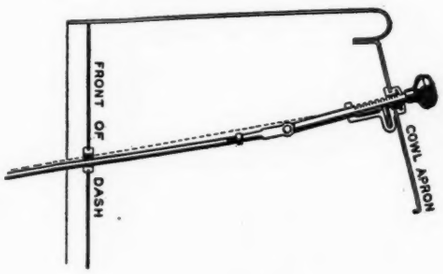


Hydrovaporizer for injecting a mixture of water and air into the intake manifold

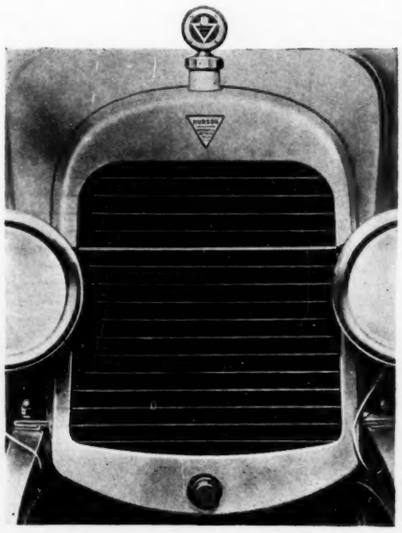
Hudson Radiator Damper

By replacing the standard radiator shell of the Hudson Super-six with a special shell housing a shutter mechanism, as shown in the illustrations, the running temperature as indicated by a Boyce Moto-Meter may be controlled from a plunger on the instrument board, the operation consisting in throttling the air passing through the radiator. The vanes of the shutter may be left completely open, as in warm weather; completely shut, as in very cold weather, or at any point between these extremes which the Boyce Moto-Meter indicates as securing the best running temperature. In installing, it is only necessary to change the radiator shell, drill a hole in the instrument board and another in the dash, and then to connect the operating plunger on the instrument board with the bell crank of the shutter by a control rod. No machine work is required in the installation, which may be made in 2 to 3 hr. With the Boyce Moto-Meter, which is a necessary part of the device, the price is $25. If the car is already equipped with a Boyce Moto-Meter the remainder of the equipment sells for $15.—Hudson Motor Car Co., Detroit.





Above — Control of Hudson radiator damper which is shown below on a Hudson Super-six. Vanes of shutter are operated from instrument board in accordance with reading of Boyce-Moto-Meter mounted on radiator

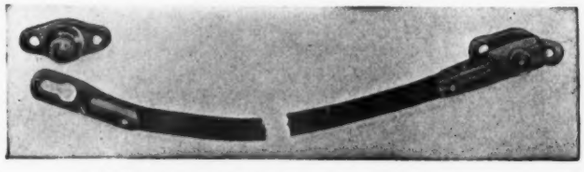


King Anti-Rattler

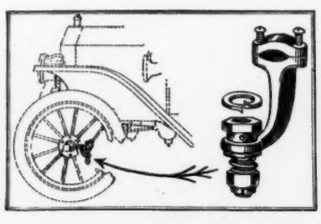
This anti-rattling device is made for attachment to the steering spindle of Ford, Overland and Dodge cars. A hanger is secured to each end of the tie-rod, the lower end rigidly supporting the spindle and carrying a spring that is said to automatically take up wear. It is easily attached by anybody. Price, $1.50 per pair.—King Specialty Mfg. Co., 207 Washington Street, Brookline, Mass.

Ideal Robe Rail

The Ideal rail is detachable at one end to facilitate placing coats, robes, etc., in position. The center of the rail is leather over cord and the ends are nickel plated. It is regularly furnished in 18½-in.

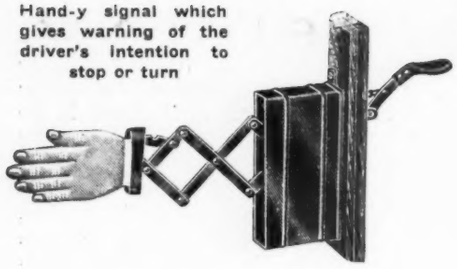


Ideal robe rail which is detachable at one end



King spindle joint anti-rattler

Hand-y signal which gives warning of the driver's intention to stop or turn



lengths although other lengths are made to order. There is a special rail 24 in. long for Ford cars. The rails sell for 75 cents.—Ideal Brass Works, Tenth Street and Canal, Indianapolis.

Hand-y Signal

Extending a hand from the side of the car on a lazy tongs device operated by the driver, this device gives warning of an intended stop or turn. The signal consists of a bright-red metal hand fastened to the end of steel folding members that fold into a metal case attached to the side of the car. The hand is swung to the extended or closed position by a lever on the open-car model; on the closed-car model it is operated by a chain. It may be attached to any car in 5 min., it is said. Special emphasis is laid on the simplicity of its installation on closed bodies. For open cars the signal costs $3; for closed cars, $3.50.—Kaenjay Sales Co., 105 Chambers Street, New York.

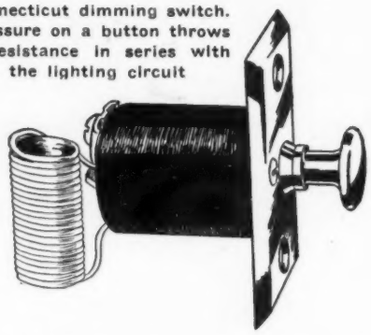
Nitrojector Spotlight

This searchlight has an adjustable focus mounted on the windshield by means of a swiveled clamp. The rays of the light are controlled by a shutter around the bulb of the lamp and controlled by a thumbscrew placed in the handle of the lamp. The rays may be controlled from a small ribbon having a diameter of 4 ft. at 500 ft. to the general illumination common to all lights, it is claimed. Another advantage claimed is that the lamp is entirely free from glare. Price, $10, complete.—Hawthorne Mfg. Co., Bridgeport, Conn.

La French Spark Plug

These plugs are claimed to enable the car owner to get the same mileage under similar conditions of load, road and distance with a mixture of 60 per cent kerosene and 40 per cent gasoline in the tank as with gasoline only. A feature of the construction is the use of porcelain baked inside the independent steel shell. The porcelain is also protected above the shell by Bakelite. An asbestos packing around the independent steel shell provides for heat expansion and a twin conical porcelain prevents short-circuiting. The construction of the plug is clearly shown in the accompanying illustration. The manufacturer claims that it is never necessary to take this plug apart to clean it,

Connecticut dimming switch. Pressure on a button throws a resistance in series with the lighting circuit



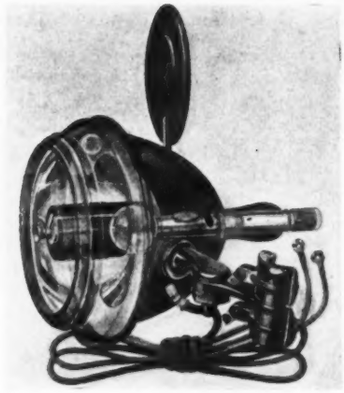
and the spark gap, which is ⅛ in. wide, is unusually accessible besides having the advantage of extending well down into the combustion chamber. Plugs are made in ½ in. and ⅞ in. S. A. E. sizes and sell for $1.—La French Spark Plug Co., 206 Meredith Street, Dayton, Ohio.

National Safety Signal

The driver's intentions are manifested by electrically lighted semaphores attached at each side of the windshield. The light carried at the end of the left arm is red, the one at the right green, and either or both may be swung from the vertical to the horizontal position by means of a knob attached to the dash at a point convenient to the driver. As the light drops to the horizontal position it lights automatically, pointing the direction that the driver intends to turn. Price, $15, installed. — National Auto Signal Co., 251 West Seventh Street, St. Paul, Minn.

Connecticut Dimming Switch

A button switch located at a point convenient to the driver throws a resistance in series with the lighting circuit, causing the lights to grow dim. The resistance consists of a small coil of special wire connected at each end to two binding posts secured in the end of a hollow fiber cylinder. On the interior of this cylinder are two brass brushes, secured at one end to the binding posts, the other ends resting on the switch plunger. The inner end of this plunger

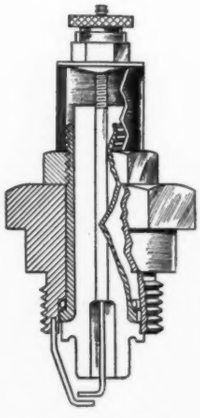


Nitrojector spotlight

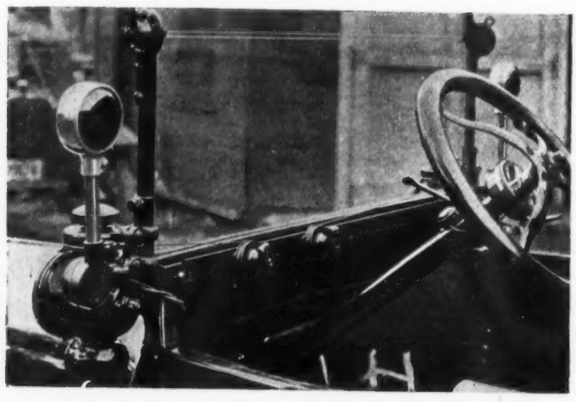
is uninsulated and grooved, the balance of the plunger being insulated so that when the plunger is pressed in as far as possible the ends of the two fiber brushes are disconnected and the current forced to pass through the resistance wire. By pulling on the plunger the two brushes come into contact with the metal end, are short-circuited, and the lighting current allowed to pass unrestricted. The installation requires only that a ⅞-in. hole be drilled in the dash, the insulating cylinder slipped in place and the plunger plate screwed onto the face of the dash. One wire of the lighting circuit is then cut at any point and each of the two ends attached to its respective binding post on the dimming switch.—Connecticut Telephone & Electric Co., Meriden, Conn.

Steering Gear for Fords

A steering gear installation for Fords. The operating member is a hollow sphere, having a spiral groove cut in its surface. A boss on the yoked shaft bearing the steering arm rides in this groove, and is moved or held by the metal sphere. The gear works on roller bearings, and is said to be exceptionally easy to operate. It is also claimed to be exceptionally easy to operate, and to require but one turn of the wheel to throw the wheels from one extreme to the other.—Price, $12.50.—Nash Mfg. Co., 1723 O Street, Lincoln, Neb.



La French spark plug



National Safety semaphore signal mounted on a car

Industrial Miscellany

Factory

Dupont Fabrikoid Co., Toronto, Ont., is erecting new buildings. Estimated cost of buildings is $75,000 and estimated cost of machinery $175,000.

Crown Tire & Rubber Co., Ralston, Neb., is planning a factory to consist of six buildings.

Field Motor Co., Grand Rapids, Mich., has purchased the Brown & Sehler factory in this city for $14,000 and will manufacture a motor under patents owned by E. A. Field.

Auto Specialties Mfg. Co., Joliet, Ill., will build a two-story, 80 by 400 ft., factory on Edgewater Field at a cost of $25,000.

Canton Auto Parts Mfg. Co., Canton, Ohio, recently incorporated with a capital of $300,000, is planning a 50 by 200 ft. plant.

Mayo-Skinner Mfg. Co., Chicago, is now in its new home at 2115 Elston Avenue, Chicago. This company manufactures hand pumps, spark plug pumps, air compressors, electric garage pumps.

Doehler Die-Casting Co., Brooklyn, N. Y., has let a contract for the construction of a steel and concrete addition, 50 by 100, seven stories, and costing about $150,000.

C. A. S. Products Co., Columbus, Ohio, manufacturer of automobile gears, has completed alterations at its plant, which has more than doubled in capacity. The company is employing 130 men.

Sheller Wood Rim Manufacturing Co., Portland, Ind., which is capitalized at $25,000, has been formed. The company will manufacture single-piece wooden automobile steering wheel rims, the patents on which are held by H. E. Sheller. Directors of the company are Mr. Sheller, E. J. Minch, A. F. Blowers, E. M. Haynes and Carl Bimel. Plans are under way for the erection of a new plant for the company.

H. and M. Auto Parts Co., Cambridge City, Ind., has been incorporated with a capitalization of $10,000 to manufacture piston rings and piston heads. The officers are O. E. Huddleston, president; C. J. Marson, vice-president, and C. J. Marson, secretary-treasurer. The company has set no date for beginning operations.

Mitchell Motors Co., Racine, Wis., is building several thousand feet of new sidetracks and loading platforms, the existing system of more than three miles of trackage in and around the plant being inadequate to handle the record-breaking shipments of Mitchell cars. Both the Chicago & Northwestern and Chicago, Milwaukee & St. Paul lines run directly into the big works and provide unusually good facilities for shipping.

Personal

A. J. Miller, president; J. H. Wells, vice-president, and E. P. Humphreys, secretary-treasurer, are the officers of the recently formed Bellefontaine Automobile Co., Bellefontaine, Ohio, to manufacture automobiles.

D. J. Hayden, formerly sales manager of the Marion Motor Car Co., Indianapolis, Ind., is the head of a new company, the Hayden-Steele Co., which will handle the retail sales of Hupmobiles in Indianapolis and Marion County. The new firm has headquarters at 544-546 North Meridian Street. Associated with Mr. Hayden is J. P. R. Steele, secretary of the firm, who for several years has been Southern manager for the D. L. Auld Co., Columbus, jewelry maker.

E. E. Russell has been appointed general purchasing agent of the J. I. Case Threshing Machine Co., Racine, Wis. His appointment takes effect Jan. 1. Mr. Russell has been with the Case Company since 1889. For the past 12 years he has been in charge of foreign sales. Prior to that he had served the company as salesman, collector, branch house manager and assistant sales manager; later was engaged in opening up a number of foreign branches, which led up to the position of manager of foreign sales. He has also been connected with the cost department.

Capt. Oliver Hezzelwood has resigned his position as manager of the Toronto branch of the McLaughlin Motor Car Co., in order to devote all his time to military work. Captain Hezzelwood was president of the Citizens' Recruiting League and is now acting as a special recruiting officer in the Toronto military district. C. M. Ricketts succeeds Mr. Hezzlewood.

The Automobile Calendar

ASSOCIATIONS

Dec. 2-9—Electricians' Country-wide Celebration.
Jan. 9—New York City, National Automobile Chamber of Commerce, Annual Banquet at Waldorf-Astoria.
Jan. 9-11—New York City, Society of Automobile Engineers' Mid-Winter meeting, Thursday, Jan. 11, S. A. E. day. Annual Banquet, Hotel Biltmore, Special performance Ziegfeld's Midnight Follies.
Jan. 10—New York City, Motor and Accessory Manufacturers' Banquet, Waldorf-Astoria.
Nov. 16—New York City, S. A. E. Meeting.
Nov. 23—Philadelphia, Pa., S. A. E. Meeting.
Dec. 7—Baltimore, Md., Safety First Convention of Safety First Federation of America.

CONTESTS

Nov. 24 and 25—Newark, N. J., 24-Hr. Endurance Run of N. J. Automobile and Motor Club.
Nov. 30—Uniontown, Pa., Speedway Race.
Nov. 30—Los Angeles, Cal., Ascot Speedway 200-mile Championship Race.

1917

April—Los Angeles to Salt Lake City Road Race.
May 19—New York Metropolitan Race on Sheepshead Bay Speedway.
May 30—Indianapolis Speedway Race, Championship.
June 9—Chicago, Ill., Speedway Race, Championship
June 23—Cincinnati, Ohio, Speedway Race.
July 4—Omaha, Neb., Speedway Race, Championship.
July 14——Des Moines, Iowa, Speedway Race, Championship.
July 4—Tacoma, Wash., Speedway Race, Championship.
Aug. 4—Kansas City Speedway Race.
Sept. 3—Cincinnati, Ohio, Speedway Race, Championship.
Sept. 15—Providence, R. I., Speedway Race, Championship.
Sept. 29—New York, Speedway Race, Championship.
Oct. 6—Kansas City Speedway Race.
Oct. 13—Chicago Speedway Race.
Oct. 27—New York Speedway Race.

SHOWS

Nov. 20-25—Worcester, Mass., Show, Worcester Casino; Worcester Automobile Dealers' Assn.
Dec. 2-9—Springfield, Mass., Show, Auditorium, H. W. Stacey, Mgr.
Dec. 9-16—Akron, Ohio, Show for Passenger Cars Only, Market Street Gardens, Akron Automobile Dealers' Show Assn.
Dec. 18-20—San Francisco, Cal., Automobile Salon De Luxe, Palace Hotel, I. B Gates, Mgr.
Dec. 30-Jan. 6—Cleveland Automobile Accessory Show, Dreamland Auditorium.
Dec. 30-Jan. 6.—Cleveland, Ohio, Sixteenth Annual Show, Wigmore Coliseum, Cleveland Automobile Club.
Jan.—First Pan-American Aeronautic Exposition, New York City; Aero Club of America, American Society of Aeronautic Engineers, Pan-American Aeronautic Federations.
Jan. 2-10—New York, Automobile Salon, Hotel Astor, J. R. Eustis, Mgr.
Jan. 6-13—New York City, Show, Grand Central Palace, National Automobile Chamber of Commerce.
Jan. 7-10—Philadelphia, Show, Philadelphia Automobile Trade Assn.
Jan. 9-10—Fort Dodge, Ia., State Convention, Iowa Retail Automobile Dealers' Assn.
Jan. 20-27—Detroit, Mich., 16th Annual Show, Detroit Automobile Dealers' Assn.
Jan. 22-27—Rochester, N. Y., Show, Exposition Park, Rochester Auto Trades Assn.
Jan. 22-27—Buffalo, N. Y., Show, Broadway Auditorium, Buffalo Automobile Dealers' Assn.
Jan. 23-27—Baltimore, Md., Show, Fifth Regiment Armory.
Jan. 27-Feb. 3, 1917—Chicago Ill., Show, Coliseum, National Automobile Chamber of Commerce.
Jan. 20-27—Montreal, Que., Automobile Trade Assn.
Feb.—Newark, N. J., Show, First Regiment Armory.
Feb. 3-10—Minneapolis, Minn., Show, Minneapolis Automobile Trade Assn.
Feb. 5-9—Boston, 8th National Good Roads Show, Mechanics' Bldg.
Feb. 10-18—San Francisco, Cal., Pacific Automobile Show, G. A. Wahlgreen, Mgr.
Feb. 12-17—Louisville, Ky., Show, First Regiment Armory, Louisville Automobile Dealers' Assn.
Feb. 12-17—Cedar Rapids, Ia., Show, Cedar Rapids Automobile Trade Assn.
Feb. 18-25—St. Louis, Mo., Show, Automobile Manufacturers' and Dealers' Assn.
Feb. 19—Pittsfield, Mass., Show, Armory. J. J. Callahan, Mgr.
Feb. 19-24—Duluth, Minn., Show, Duluth Auto Dealers' Assn., Armory.
Feb. 19-24—Bridgeport, Conn., Show, Armory, Coast Artillery Corps.
Feb. 19-24—Syracuse, N. Y., Show, State Armory, Syracuse Dealers' Assn.
Feb. 26-March 3—Omaha, Neb., Show; Auditorium, Omaha Automobile Show Assn.
March 1, 2, 3—Urbana, Ill., Show, Automobile Trade Assn. of Champaign Co. Armory of the University of Ill.
March 3-10—Boston, Mass., Show, Mechanics' Bldg., Boston Automobile Dealers' Assn.
March 6-10—Ft. Dodge, Iowa, Northern Iowa Show, New Terminal Warehouse, G. W. Tremain, Secretary.
March 14-17—Davenport, Ia., Show, Coliseum Bldg., Tri-City Automobile Trade.

Personal

S. R. Scott has become district sales representative of the Denneen Motor Co., Cleveland, maker of the Denmo trucks. This company has appointed the Butler-Veitch Co., Berkeley, Cal., as its distributor in that territory.

George Price will handle the sales department of the J. A. & W. Bird Co., Boston, covering the entire territory south of New York, as far west as the Mississippi, and also including the states of Louisiana and Texas. He was formerly manager of its New York office.

C. T. Kenworthy has become vice-president and general manager of the Roamer Motor Car Co., Chicago. He was formerly distributer for the Rauch & Lang electric in New York.

T. E. Hanika, an Indianapolis newspaper man, has been appointed manager of the advertising department of the Gibson Co., Indianapolis, Ind., Overland and Willys-Knight distributor in Indiana, and automobile tire and accessory dealers. He succeeds R. T. Farrington, who has gone to San Francisco, Cal., to engage in publicity work.

James Coggeshall has been appointed manager of the wholesale department of the R. E. Taylor Co., New York, distributor for aGrford trucks in this city, New Jersey and New England.

W. P. Pollitzer has become sales manager of the Rock Island Mfg. Co., Rock Island, Ill. He was formerly Chicago branch manager of Edw. V. Hartford, Inc., Jersey City, N. J. The local company manufactures hardware specialties and automobile specialties. Mr. Pollitzer was with the Hartford company for 15 years. He takes up his new duties Dec. 1. Edward Leinbach will succeed Mr. Pollitzer at Chicago.

R. Adamson has been appointed manager of the Birmingham, Ala., branch of the Ford Motor Co. R. C. Ruggles, former chief clerk, has been made assistant manager. G. C. Nicholes, who came to Birmingham from Seattle, has been transferred to Cincinnati as manager of the assembling branch in that city.

A. E. Morrison has joined the staff of the Maxwell Motor Co., Detroit, as special sales representative. Mr. Morrison was formerly branch manager on the Pacific Coast for the Hupp Motor Car Corp.

Dealers

Nova Scotia Velie Co., New Glasgow, N. S., has been formed to handle the Velie car.

Southern Arizona Motor Co., Tucson, Ariz., has been made distributer for the Mitchell.

S. H. Blackburn and Edward Olson have been appointed Arizona agents for the Pullman, with headquarters at 235 West Washington Street, Phoenix.

G. S. Holvey, who has been operating as the Holvey Motor Truck Sales Co. in Rochester, N. Y., will, on Dec. 1, become city sales manager of the Selden Motor Truck Sales Co., Rochester. A local branch will be established in Rochester.

J. B. Crockett Co. has secured the exclusive sales rights for the Branford carburetor in South America, Australia, New Zealand, Tasmania, South Africa, Straits Settlements and Dutch and British India. The Branford carburetor, marketed by the Holt-Welles Co., 1790 Broadway, New York, is designed for Fords and other cars.

Boice Motor Equipment Co., Boston, is now handling the Heinze-Springfield starter for Fords, the Vesta Accumulator Co.'s products. It also represents the K. W. Ignition Co. and the Standard Thermometer Co.

Automobile Supply Co., Tacoma, Wash., has been appointed distributer for Rayfield carburetors for all of western Washington, Kittitas and Yakima counties in eastern Washington.

W. H. Wallingford, Portland, Ore., Ford agent, has moved into larger quarters at 908 Alder Street.

J. E. Tryzelaar, Portland, Ore., has been named distributer for Grus Spring Oiler and opened headquarters at 29 N. Broadway.

Richard Rinne, Tacoma, Wash., has purchased the Commercial Auto Co. He has also taken over the agency for the Velie.

E. M. Lang, Auburn, Wash., has secured the territory in Auburn and adjacent territory for the Maxwell, Oakland and Chalmers.

Kaenjay Sales Co., 105 Chambers Street, New York, which has taken over the exclusive distribution of the Hand-y signal, is composed of L. T. Kauffmann and R. L. Jones, both of whom have had previous connection with the industry. Mr. Kauffmann was sales manager and Mr. Jones factory superintendent of the Nonpareil Horn Mfg. Co., New York.

Van Cortlandt Vehicle Co., New York, has opened salesrooms at Sixty-third Street and Broadway to handle the Peerless cars, formerly handled by C. T. Silver. Walter Woods is manager and J. A. Clark sales manager.

Marathon Tire & Rubber Co., Ltd., St. Catherines, Ont., has appointed the following distributers: Wood Vallance & Leggatt, Ltd., Vancouver, and Wood Vallance, Ltd., Winnipeg and Calgary, distributers for Manitoba, Alberta and Saskatchewan.

Constant Pressure Cycle Truly Efficient

(*Continued from page* 936)

than constant volume engines, is entirely justified, our critic to the contrary notwithstanding.

Utilization of exhaust heat brings to the proposed cycle another advantage. It enables the use of heavy fuel which without this heat would be difficult to vaporize. At practical temperatures already actually obtained, it has proved possible to make a fixed gas of the heaviest oil and to thoroughly mix it with the proper proportion of air prior to combustion. On this account, if for no other reason, the proposed engine bids fair to fill a long felt want for a prime mover free from the inherent difficulties of the Diesel engine while not dependent on highly volatile fuels for satisfactory operation.

Concerning the question of flexibility it should be noted that it is possible to vary the point of cut-off exactly as in the case of a steam engine. When the point of earliest feasible cut-off is reached, a further modification of the card may be obtained by throttling. Thus both dimensions of the card may be varied by a simple control device, with corresponding accommodation to load. In other words the proposed engine must be exceptionally flexible.

We shall not here attempt a comparison of the constant pressure and constant volume cycles with expansion carried to atmosphere for the reason that no practical constant volume engine utilizing means for expanding to atmosphere has yet been recognized. We have however already shown the utter fallacy of Mr. Napier's deduction as to relative cylinder volumes by proving that the constant pressure engine will develop more power per unit of cylinder volume at full load than the constant volume engine is able to do.

We readily admit that at light loads (where expansion is carried to atmosphere) the constant pressure engine's cylinder volume is relatively great as compared to the work output. But (even though expansion to atmosphere is not practicable in constant volume engines) it is equally true that at light load constant volume engines also have a very large cylinder volume as compared to their power output.

In view of the foregoing it would appear that our critic had jumped to the conclusion that, whereas the old Brayton type of constant pressure engine had proven an unsuccessful competitor to the Otto type, all constant pressure engines suffer the same or similar limitations. In point of fact the proposed constant pressure engine eliminates the shortcomings of the Brayton type while still retaining the latter's numerous inherent advantages. It thus introduces a new type which bids fair to replace in time engines of the Otto, Diesel and semi-Diesel types.

Mr. Napier closes his criticism with the statement: "The burner described and illustrated in considerable detail will not, however, work as an igniting device for a reciprocating engine." We make no claim to this effect. In fact a spark plug with coil or magneto is expected to answer this purpose —as is the case with the constant volume engines. Concerning the functioning of the burner for the purpose intended, the opinion of Mr. Napier is valueless since experiments already concluded have established the practicability of the burner.